Smithsonian

ARCH 1998

Prairie Dogs Need a Few Friends

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Think first.

Windows users, please stand back. Microsoft Office 98 is here, and it only runs on Macintosh.® So if you use a Mac,® you can run the most advanced versions of Microsoft Word, Excel, PowerPoint, Outlook Express and Internet Explorer. If you use a Mac, you can turn any document into a web page with just one click. If you use a Mac, you can exploit the easiest-to-install and easiest-to-maintain office suite in history. And if you use Windows—well, you can always visit a friend who has a Mac.

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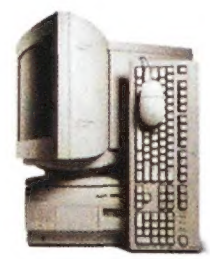

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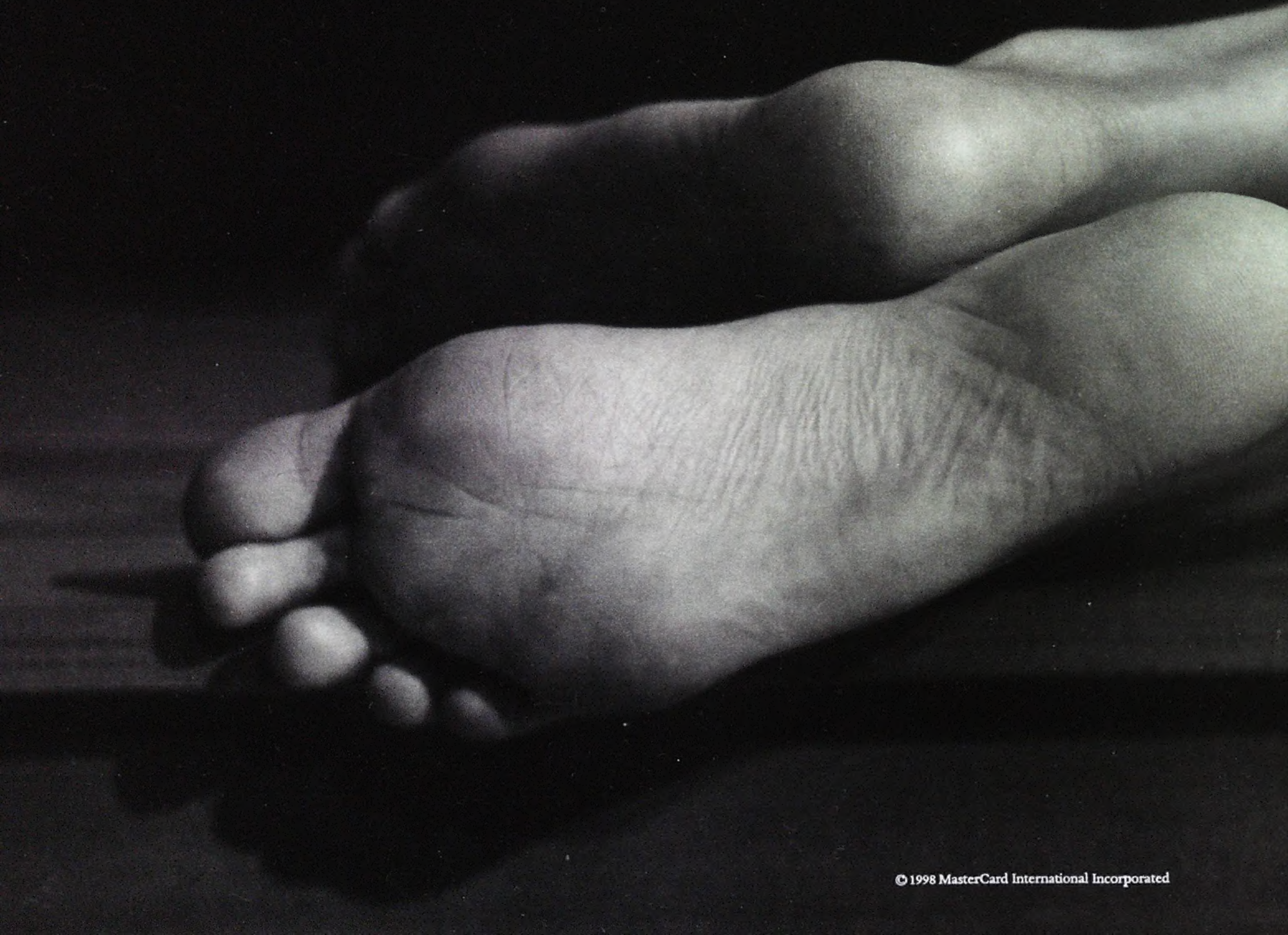

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SMITHSONIAN

departments

MARCH 1998 VOLUME 28, NUMBER 12

Cover A well-fed black-tailed prairie dog, one of five species that make their home on the Western plains, munches on alfalfa in a town at the Arizona-Sonora Desert Museum. Although the species is widespread in the West, it is not protected, and its numbers are dwindling rapidly.
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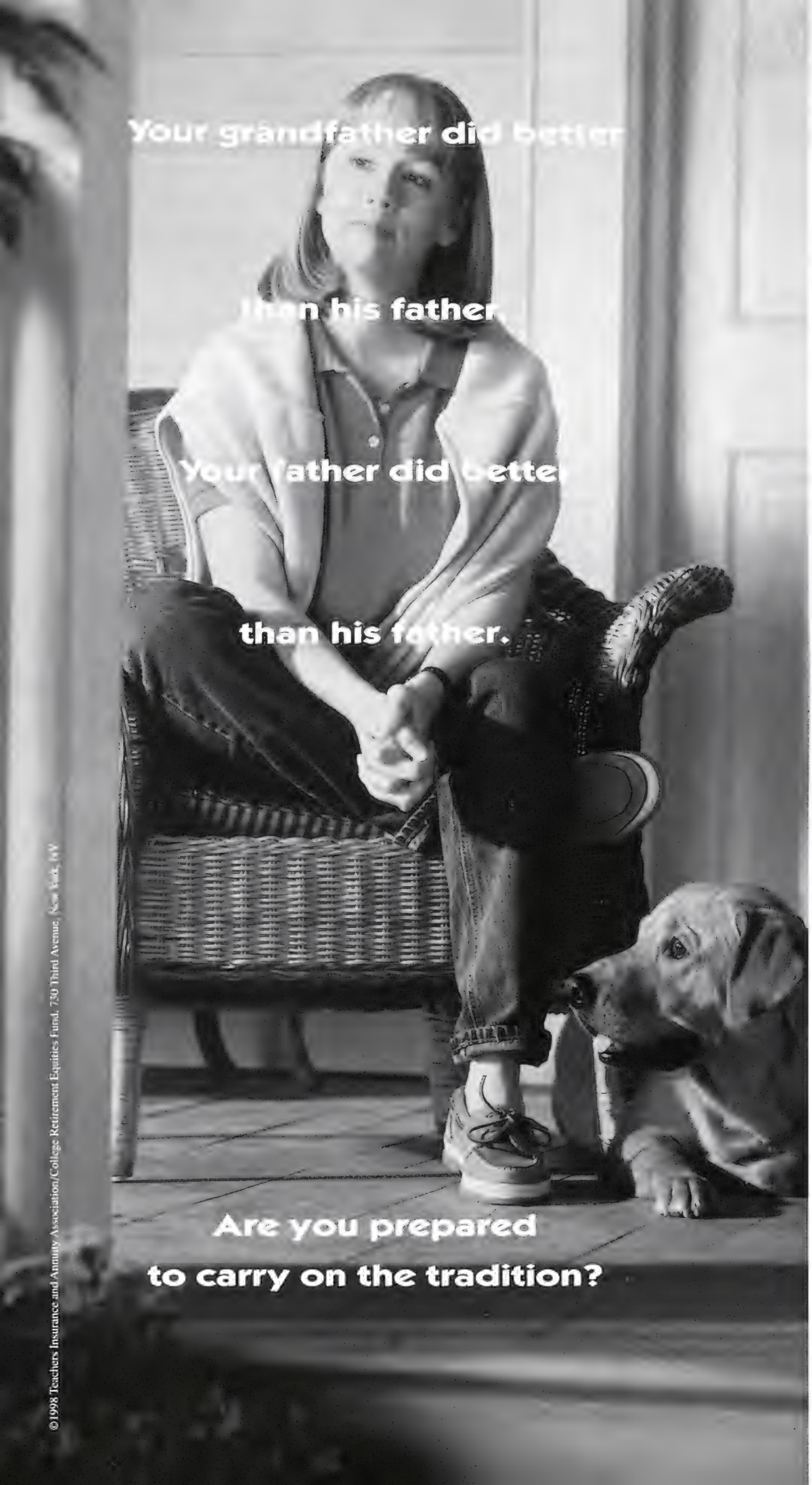

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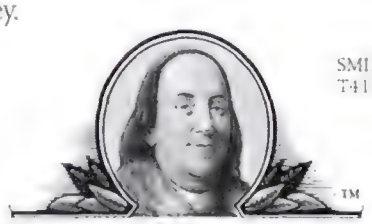

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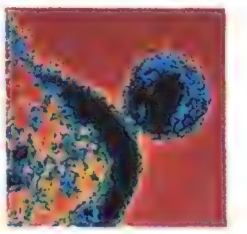
A drug he discovered for transplant patients is now helping millions fight AIDS.

Ken Richardson
Pharmaceutical company researcher

"I left high school at age 16 to do odd jobs in a small pharmaceutical lab. Back then I never dreamed that, one day, I would help discover a medicine that would save thousands of lives."

"I loved lab work, so I went back to school at night and worked at the lab during the day. After 12 years, I had my Ph.D. Then I went to work at a pharmaceutical company, where I began research on an anti-fungal medicine to treat deadly infections. For me, a drug saves more than a life. It can save a family."



HIV: The virus that causes AIDS

"Some of the most deadly infections come from fungi in the air we breathe," says Ken Richardson, a pharmaceutical company researcher. "When you have a healthy immune system, it's not a problem."

Richardson and his research team discovered a lifesaving drug in the early 1980s to treat fungal infections in cancer and transplant patients. When thousands of AIDS patients began turning up with fungal infections, they thought their new medicine might help.

"I'll never forget the first time we tried it in an AIDS patient. She was hallucinating from a fungal infection that was damaging her brain," said Richardson. "The doctor gave her our drug and the next day the hallucinations were gone. Two weeks later she left the hospital." Today, the drug Richardson discovered for his company helps millions of people around the world.

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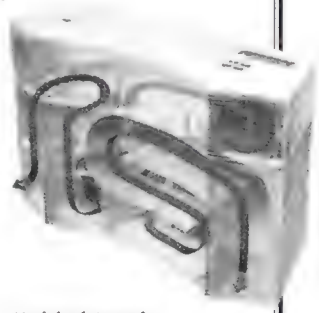

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SMITHSONIAN PERSPECTIVES

Singing Our Praises

WITH CREATIVITY AND A VAST COLLECTION, THE SMITHSONIAN HAS BECOME A LEADER IN PRESERVING OUR MUSICAL HERITAGE

RECENTLY I CAME ACROSS A VINTAGE PHOTOGRAPH that reminded me of the Smithsonian's long association with music—an interest that goes back to the mid-19th century when the Institution started collecting guitars and brass instruments. This particular photograph, from 1916, depicts Frances Densmore, a Smithsonian anthropologist with the Bureau of American Ethnology, and Mountain Chief, a Blackfoot Indian, sitting in front of the Castle with an early Edison machine. In the course of 50 years, Densmore traveled to remote reservations and villages recording the songs of some 30 Indian tribes on wax cylinders and collecting hundreds of musical instruments.

Today we are still recording music and collecting its associated objects and documentation. The most visible form of this activity is the Folklife Festival, which has been held on the Mall every year since 1967 and has highlighted hundreds of performing groups from our nation's diverse communities as well as from around the world. Recordings of these groups and others are conserved and sold under the Smithsonian Folkways label. In addition, the Archives Center in the National Museum of American History (NMAH) contains rich documentation of American music. The museum has a vast keyboard and string instruments collection, including 180 pianos from 1770 to the present, five Stradivarii and outstanding examples of harmonicas, Appalachian dulcimers, banjos and guitars.

Merely displaying historic instruments and original scores in glass cases or preserving them in archives would be a deadly enterprise, so we have consciously tried to bring our collections alive. Many performances of the Smithsonian Chamber Music Society presented over the past 18 years have involved the use of instruments from the NMAH collection; in fact, we are acknowledged leaders in the movement to perform on original instruments. Now in its seventh season, the Smithsonian Jazz Masterworks Orchestra, founded with a congressional appropriation in recognition of the importance of jazz in American culture, draws on the Museum's History of Jazz Collection and its Duke Ellington Collection to recreate classic jazz performances. These concerts are immensely popular, and our audiences have grown steadily.

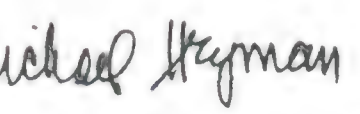
Other musical endeavors of which we are duly proud include our award-winning radio productions, tapes and CDs. Two of our Smithsonian recordings have won Grammy awards in the past, and *The Anthology of American Folk Music* received two nominations this year. The Sackler and Freer galleries sponsor musical events that artfully combine Western and Asian music, both traditional and contemporary, and the George Heye Center in New York features talented Native American musicians and dancers. The Smithsonian Associates program offers the public a variety of musical programs in connection with exhibitions and research. Recently young as well as older audiences flocked to American History's series on the electric guitar.

Music in recent years has proven to be a rallying point, capable of pulling together many of our enormously broad resources in new ways. We have seen this largely as a result of seminal support from two corporations and one foundation. In 1992 we received $7.5 million from the Lila Wallace Reader's Digest Fund to be spent on various jazz-related projects over a ten-year period. Major sponsorships from Nissan Motor Corporation U.S.A. and Discover Card followed, enabling the Institution to create an unprecedented outpouring of exhibitions, symposia, public programs, recordings, radio productions, CDs, scholarly resources and curriculum materials that will continue into the future.

It is difficult to do justice in such a short space to all of the musical projects at the Institution. The jazz exhibitions are noteworthy because they are all being toured by the Smithsonian Institution Traveling Exhibition Service (SITES) to cities across the country. SITES also tours exhibitions of gospel, folk music and American musicals.

What does the future hold? For starters, we are trying to duplicate the model we have established in jazz for the full gamut of Latino music. NMAH is planning an exhibition and performance to celebrate the 300th anniversary of the invention of the piano. The museum is also forging new partnerships with universities and music schools to increase outreach to students. In May we mark the 50th anniversary of Folkways with a Carnegie Hall concert.

Although our plans are ambitious, the enthusiasm of our staff is extremely high. As one of them said to me recently, "the ear has no boundaries." Music has provided us with special windows on cultures all over the world throughout our history. Now it promises exciting new audiences.



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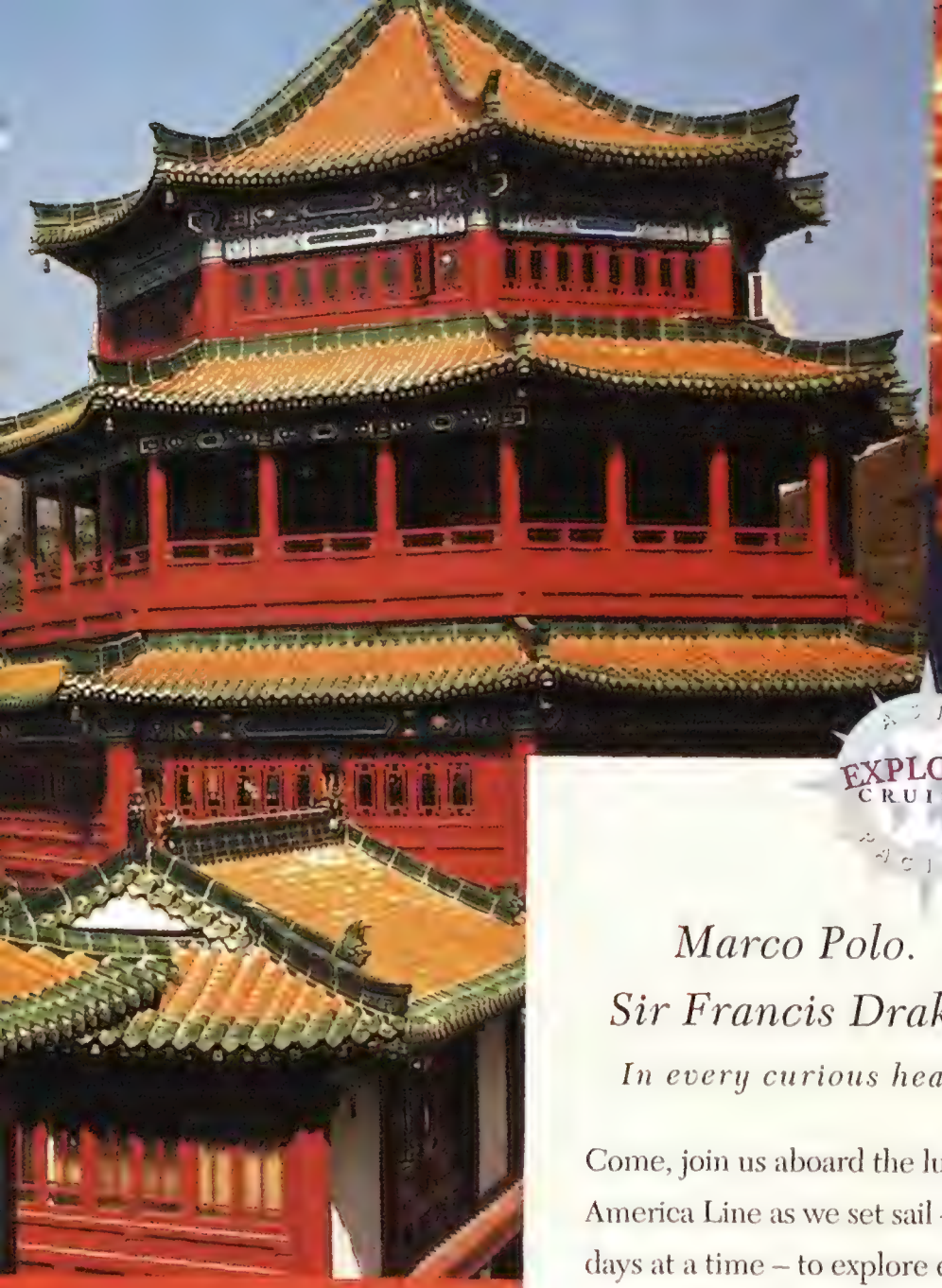

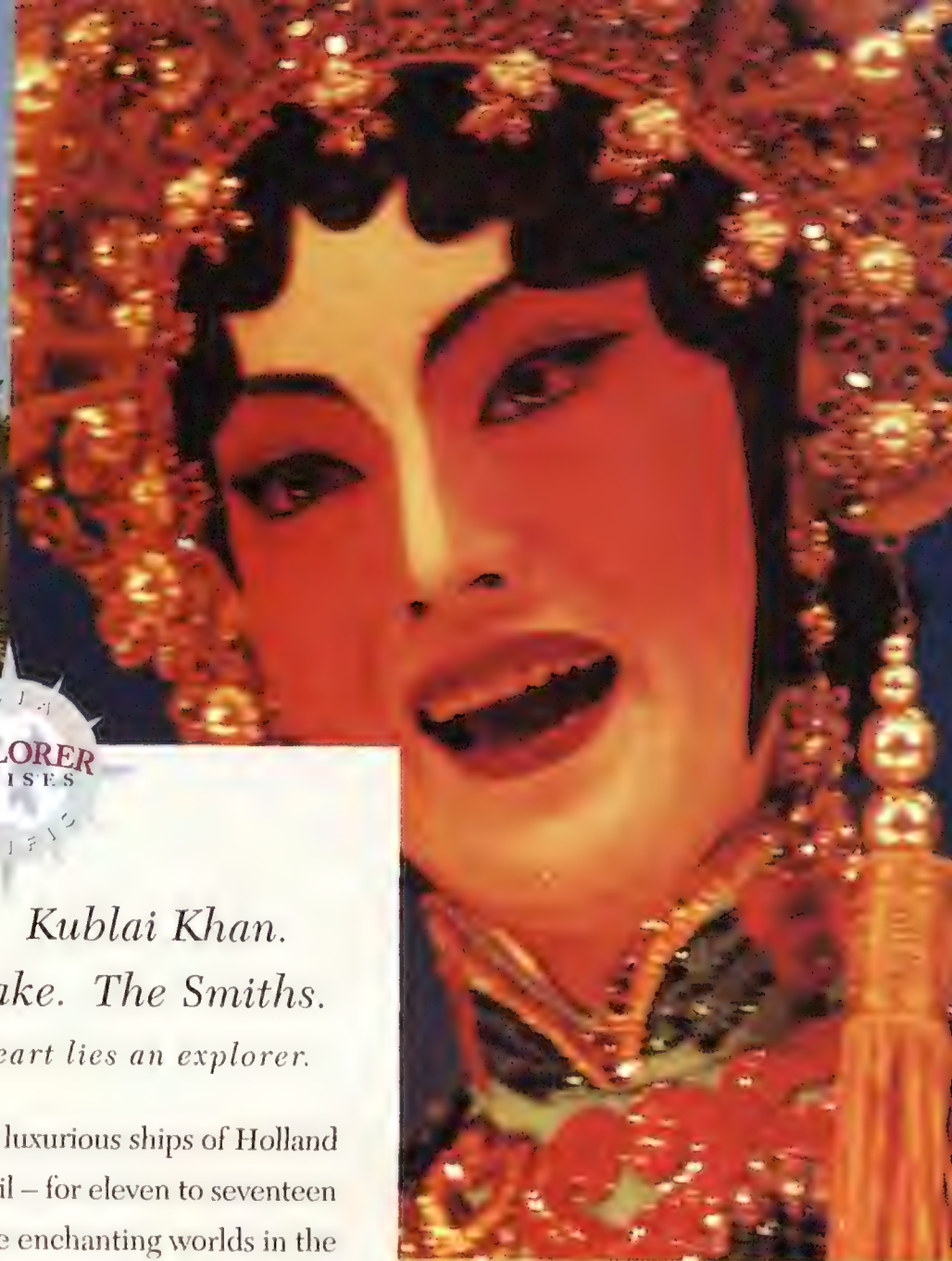

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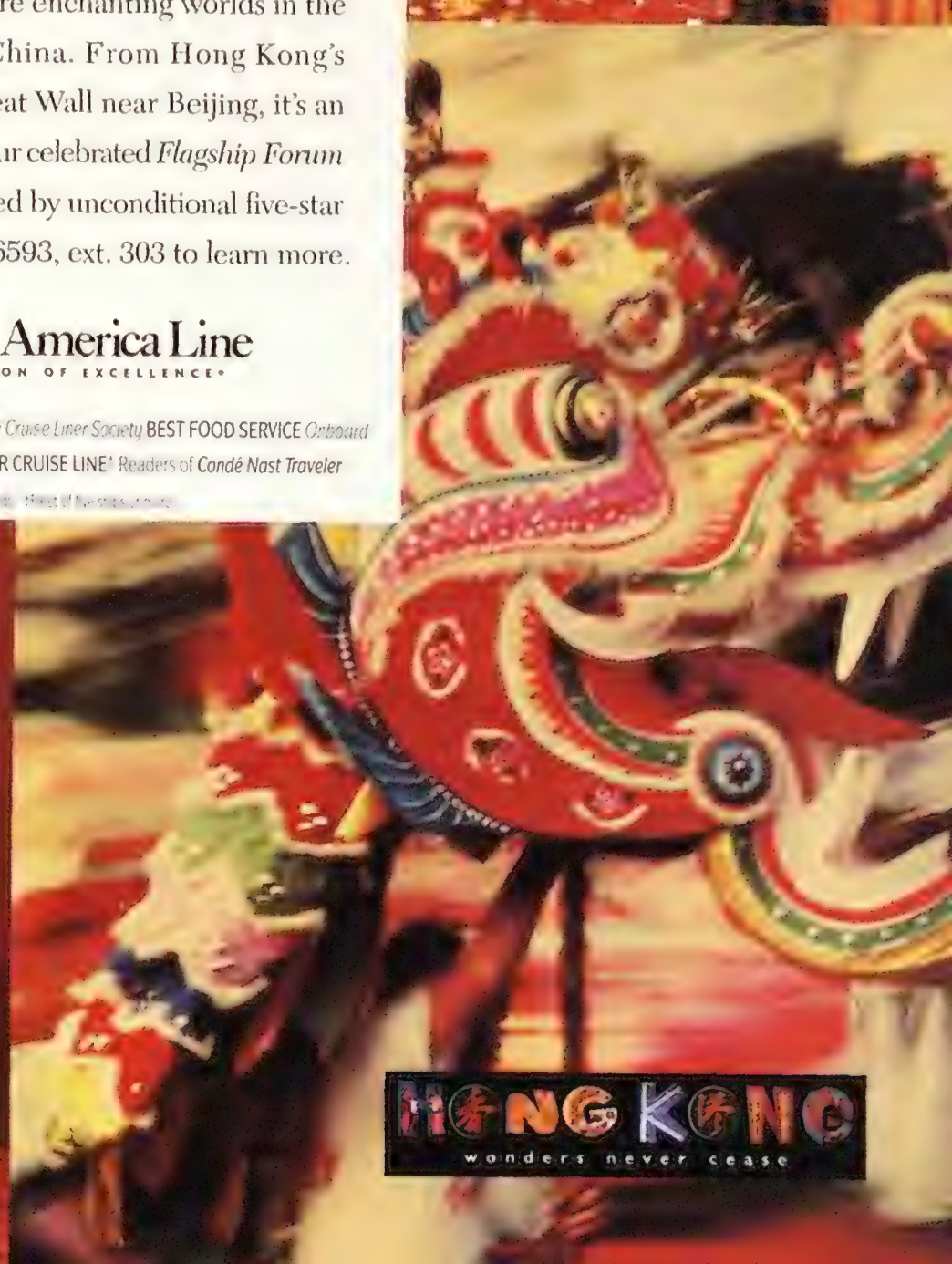

THE OBJECT AT HAND

THANK YOU FOR THE JANUARY COLumn by John Ross about stamps, which brought to mind a story about Mary Goulding Fawcett, a parishioner of St. Paul's Episcopal Church in Alexandria, Virginia. In 1907, she was cleaning out her sewing box and found an old letter with an odd-looking stamp on it. She kept the letter, which contained a proposal of marriage written by her father, J. Wallace Hooff, in 1846 to her mother, Jannett Brown. Being a little short of cash, she sold the blue, simply designed, circular stamp still affixed to the envelope for the then princely sum of $3,000. The "Alexandria Blue Boy," as the rare stamp is now known, changed hands several times after that. In the early 1980s, it was resold in Europe for a purported $1 million. Issued by Alexandria postmaster Daniel Bryan in 1846, the "Blue Boy" was one of the last of the provisional stamps that were distributed before federal postage became mandatory on July 1, 1847.

Ruth Lincoln Kaye
Historian, St. Paul's
Alexandria, Virginia

BY 1848, GEN. ZACHARY TAYLOR HAD told the Baton Rouge, Louisiana, postmaster that he would no longer pay for letters sent collect. In early June of that year, the Whig Party nominated Taylor as their candidate for President of the United States at their national convention in Philadelphia, and party chairman John M. Morehead of North Carolina wrote Taylor, advising him as such. The general didn't respond. In late June, Morehead wrote again. The first letter, it turned out, was sitting in the Baton Rouge post office, postage due. Taylor waited until he was going that way, paid the postage, read the letter and accepted the nomination.

Col. Barney Oldfield
Beverly Hills, California

IT IS INTERESTING TO NOTE THAT THE Penny Black, one of England's first national postage stamps, was not originally enthusiastically accepted by all of the British people. Some people deemed it unseemly to lick the stamp and slobber all over the back of Queen Victoria's head.

Dennis J. Whelan
Franklin Square, New York

BAKU

AS A RETIRED GEOPHYSICIST, I WAS considerably interested in Ruth Daniloff's article about Baku, Azerbaijan, "Waiting for the Oil Boom." While the article dwelt heavily on historical and political aspects, it devoted only one sentence to the modern technology that "has been used to estimate the vast untapped wealth of the region." Did this modern technology include geological or geophysical analysis?

L. L. Hammial
Shreveport, Louisiana

A ship belonging to Caspian Geophysical, a company owned by Azerbaijan's SOCAR and PetroAlliance Services of Houston and Moscow, has been collecting data on the hydrocarbon deposits in the Caspian Sea for the Azeri government and the oil consortiums. The ship uses the latest equipment, most of which is made in the United States, to gather seismic (both two-dimensional and three-dimensional) and other geophysical data. Data analysis has been greatly enhanced by recent advances in computer technology. Ed.

MUSSELS

WHAT A SPLENDID ARTICLE BY ADELE Conover about mussels. It had scholarly accuracy, local information, enthusiasm and wit. Before reading the article, only two encounters with mussels brought them to my attention. One in Tours, France, involved a bowl, garlic and wine sauce. The other was on the Mendocino coast of California while I was hunting for abalone and stepped upon a weedy rock that hosted mussels. I skidded across their slippery shells and landed in an ice-cold pool of the Pacific. Trying to pull myself out, my first handhold on the rock proved to be an unaccommodating octopus. A friend rescued me.

Beverly Hemphill
Redwood City, California

LATE IN THE LAST CENTURY AND early in this one, Illinois was also a source of freshwater mussel shells and pearls. The Illinois Fish Commissioner's report for 1906-08 stated that more than 19 million pounds of mussel shells were taken from the Illinois River by the towns of Havana, Matanzas, Bath, Browning, Beardstown and Meredosia in the year ending October 1, 1908. Beardstown was credited with the most: 12,415,000 pounds. Estimates of the value of pearls and shells for 1909 ranged as high as $4 million.

Several families in the village of Browning, my hometown, made a good part of their living by drilling button blanks out of the shells. They sent most of these to Muscatine where they would be pierced with holes and sewn onto shirts and other clothing items.

Warren L. Royer
Kalamazoo, Michigan

GEORGE SEGAL

PHYLLIS TUCHMAN QUOTED SCULPture commentator Michael Brenson as saying about George Segal's pieces at the FDR Memorial, "It's amazing how [people] empathize with this work even when they don't know what it means." This predilection for "meaning" over feeling is one of the great maladies affecting art and art criticism at the end of this century. I am sick

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of going to galleries and museums and having to read an artist's statement before I can understand or appreciate his or her work of art. Is it truly so "amazing" that people can respond to Segal's work without knowing its cachet or Segal's intent? As the old saying about meaning goes, it's the bone that the burglar throws the dog as he ransacks the house.

Dale W. Boyer
Chicago, Illinois

AMERICAN CIVIL LIBERTIES UNION

I AM APPALLED THAT YOU WOULD publish such a favorable article about the ACLU. This is a slap in the face of every law-abiding citizen in the United States. The ACLU is an anti-American, antireligion and antigovernment organization that would like to see the downfall of our society. Their not-so-well-known hidden motives are to destroy the U.S. Constitution through the courts and juries, establishing laws of their own choosing via liberal court decisions that would never be passed under normal congressional procedures.

Your headline "The ACLU Defends Everybody" is not true: they do not defend me; they attack me, the United States of America and the millions of citizens who fought, bled and died for this country.

T. Med Hogg
Baton Rouge, Louisiana

THE ACLU IS ONE OF THE MOST damaging organizations that this democracy has ever seen. Your article tried to be fair, but it could have been shortened by simply stating: "The ACLU is interested in what is legal, not just."

Stephen M. Sturm
Delaware, Ohio

THE ACLU DEFENDS THE RIGHTS OF individuals without considering the responsibilities of every individual to this increasingly densely populated society. This is a major shortcoming. Perhaps we should review the Constitution and add a Bill of Responsibilities.

Jim Gannett
Redmond, Washington

AFTER READING KEN CHOWDER'S piece on the ACLU, I cannot decide whether to be for them or against them: I do know I'm glad they're there.

Caroline J. Hodges
Eau Claire, Wisconsin

YOU STATED THAT THE ACLU "PROtects the rights given by the Constitution." The Constitution does not *give* us any rights; it legally protects them. If the government gave us our rights, then it could also take them away. This is not the case.

Lester Barto
Argos, Indiana

PAUL MCCARTNEY

AS A LIFETIME BEATLES FAN, I THANK Sue Arnold for her article about Sir Paul's efforts to pass along a bit of his genius, heart and soul by offering his music and business savvy to young artists at the Liverpool Institute for the Performing Arts. As McCartney and his partner John Lennon wrote: "All we need is love."

Deb Stephan
Upper Sandusky, Ohio

AMISTAD

THE MAGNIFICENT MURAL THAT opens Donald Dale Jackson's article "Mutiny on the *Amistad*" was one of three that Talladega College in Alabama commissioned African-American artist Hale Woodruff to paint for its new Savery Library. The third painting [above] depicts the *Amistad* Africans returning to Sierra Leone. The murals were unveiled at the April 15, 1939, opening of the library.

Janice Pollack
Talladega, Alabama

We reproduced small oil sketches of the Talladega murals that Woodruff gave to his friend George Crawford, who was a graduate of the college. The men were friends in New Haven, Connecticut, and when Crawford died, he willed the paintings to the New Haven Colony Historical Society. Ed.

WRITE TO SMITHSONIAN

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What to do when a whale calls 911.

In January 1997, a baby gray whale was found struggling along the California coast. Separated from her mother at birth, she was weak, dehydrated and barely clinging to life. Her only chance for survival was Sea World. Thanks to an around the clock team of dedicated marine mammal specialists and veterinarians, thousands of gallons of clams, fish and cream, and her very own 1.7-million-gallon pool, this big baby named J.J. is still making history. Now a robust 20,000 pounds, J.J. is ready to face her next challenge. If all goes well, her successful return to the ocean will begin a new chapter in a very special story.

J.J.'s amazing rescue touched millions of people around the world. But most of our rescues don't make headlines. They happen behind the scenes every day of the year. Dedication isn't a new idea at Sea World. Our 40-year commitment to conservation and environmental awareness continues to grow stronger every day. Just like J.J.

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Ring King

"WHO MADE THE DOUGHNUT WITH THE HOLE IN THE MIDDLE? JUST HOW IT GOT THERE WILL BE ALWAYS A RIDDLE"

BY DAVID A. TAYLOR

AT THE NATIONAL MUSEUM OF AMERICAN HISTORY one day last July, an upright piano stood on a stage. Beside it, on a wooden pallet, was a strange metal contraption about five feet high. The Ring King Jr., once America's most advanced automatic doughnut maker, had just been donated to the Smithsonian Institution by the Krispy Kreme Doughnut Corporation. It was Krispy Kreme's 60th birthday.

In my own sixth or maybe seventh year, I remember stopping in at the green, red and white Krispy Kreme place in Alexandria, Virginia. There was a wide glass window behind the counter, and you could look in there at all those shiny conveyor belts and racks filled with fresh glazed doughnuts, and half swoon at the warmth and sweet vanilla richness of it all. At the Smithsonian dedication, the Ring King was saluted as a milestone in American doughnut history. Then a singer, Cindy Hutchins, stepped up to the mike and drawing on the museum's archive of popular sheet music (more than a million songs in all) sang, "Who made the doughnut with the hole in the middle? Just how it got there will be always a riddle."

Well, yes and no. It is true that the humble doughnut does have a convoluted past that involves Dutch immigrants, Russian exiles, French bakers, Irving Berlin, Clark Gable and a certain number of Native Americans. And, yes, in its democratic ethos, its optimism, and its assorted origins, it does seem rather quintessentially American.

Of course doughnuts in some form or other have been around so long that archaeologists keep turning up fossilized bits of what look like doughnuts in the middens of prehistoric Native American settlements. But the doughnut proper (if that's the right word) supposedly came to Manhattan (then still New Amsterdam) under the unappetizing Dutch name of *olykoeks*—"oily cakes."

Fast-forward to the mid-19th century and Elizabeth Gregory, a New England ship captain's mother who made a wicked deep-fried dough that cleverly used her son's spice cargo of nutmeg and cinnamon, along with lemon rind. Some say she made it so son Hanson and his crew could store a pastry on long voyages, one that might help ward off scurvy and colds. In any case, Mrs. Gregory put hazelnuts or walnuts in the center, where the dough might not cook through, and in a literal-minded way called them doughnuts.

Her son always claimed credit for something less than that: putting the hole in the doughnut. Some cynical doughnut historians maintain that Captain Gregory did it to stint on ingredients, others that he thought the hole might make the whole easier to digest. Still others say that he gave the doughnut its shape when, needing to keep both hands on the wheel in a storm, he skewered one of his mom's doughnuts on a spoke of his ship's wheel. In an

An original Ring King Jr. at work in the 1950s, churning out Krispy Kreme doughnuts at a rate of 75 dozen an hour.

TRAPPED

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interview with the *Boston Post* at the turn of the century, Captain Gregory tried to quell such rumors with his recollection of the moment 50 years before: using the top of a round tin pepper box, he said, he cut into the middle of a doughnut "the first doughnut hole ever seen by mortal eyes."

"Doughnuts . . . walk dreamily up a moving ramp, and tumble dreamily into an outgoing basket."

One likes to think that less was more. But in fact doughnuts didn't come into their own until World War I, when millions of homesick American doughboys met millions of doughnuts in the trenches of France. They were served up by women volunteers who even brought them to the front lines to give soldiers a tasty touch of home. When the doughboys came back from the war they had a natural yen for more doughnuts. (The name "doughboy," though, didn't derive from doughnuts. It goes back to the relatively doughnutless Civil War, when the cavalry derided foot soldiers as doughboys, perhaps because their globular brass buttons resembled flour dumplings or because soldiers used flour to polish their white belts.)

Poor little rich girl Claudette Colbert gets a lesson in the plebeian art of dunking from Clark Gable in *It Happened One Night*.

The first doughnut machine did not come along until 1920, in New York City, when Adolph Levitt, an enterprising refugee from czarist Russia, began selling fried doughnuts from his bakery. Hungry theater crowds pushed him to make a gadget that churned out the tasty rings faster, and he did.

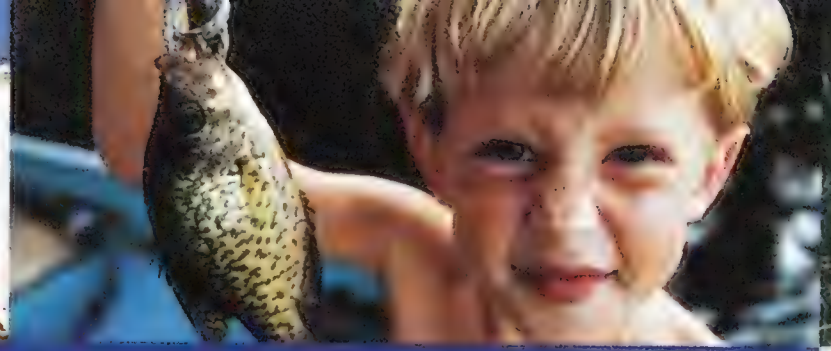
Levitt's doughnut machine was the first sign that the doughnut, till then merely a taste sensation, could, in production, become a public spectacle. And so generations of kids like me, and adults, too, have stood transfixed by the Willy Wonka-like scene behind the glass of doughnut shops, learning in the process that the doughnut hole is built in, not cut out. There before them a circle of dough, shaped like a perfect smoke ring, and about the diameter of a baseball, dropped off into a vat of boiling oil, circulated, got turned over to brown on the other side, and emerged from the oil on a moving ramp, one by one like ducks in a row.

The machines grew more refined. The idea spread. By 1931, the *New Yorker* was whispering to its readers, "We can tell you a little about the doughnut-making place in Broadway," and described how "doughnuts float dreamily through a grease canal in a glass enclosed machine, walk dreamily up a moving ramp, and tumble dreamily into an outgoing basket."

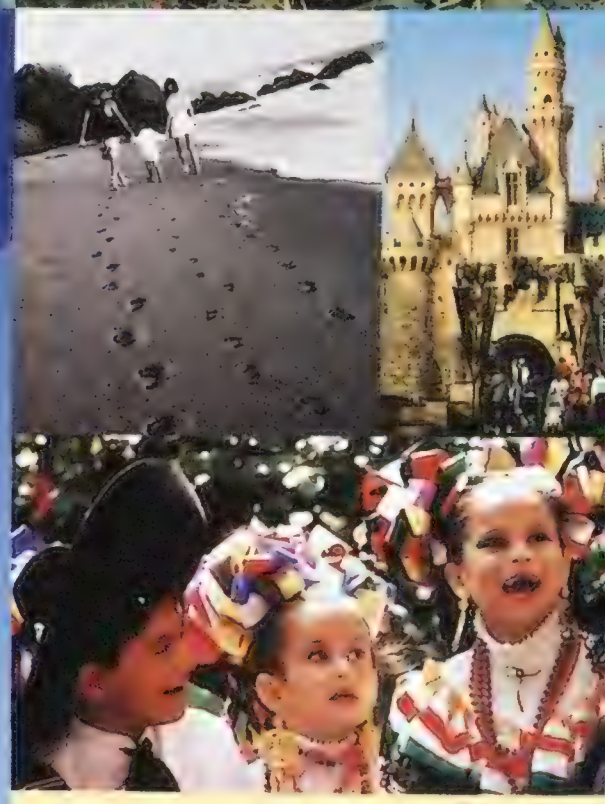
By then, Adolph Levitt's machines were earning him a dreamy $25 million a year, mostly from wholesale deliveries to bakers around the country. A company spokesman breathlessly reported that Levitt's machine had pulled the doughnut "out of the mire of prejudice that surrounded the heavy, grease-soaked product . . . and made it into a light, puffy product of a machine."

He had a point. By the 1934 World's Fair in Chicago, doughnuts were poster material, billed as "the food hit of the Century of Progress." Seeing them produced "automatically" somehow made them part of the wave of the future.

A doughnut cost less than a nickel, within reach of most of the Depression's victims. They were base and beloved. In the 1934 film *It Happened One Night*, rugged newspaperman Clark Gable actually has to teach runaway heiress Claudette Colbert how to dunk. Often, doughnuts were sold with their own can-do philosophy. Singer Cindy Hutchins' mother recalls buying them after seeing movies at Washington, D.C.'s Capitol Theater. They came with a slip of paper to bolster the downtrodden: "As you go



On a **California** *vacation,*
kids are **59% less** *likely*
to hear,
"Don't **make me**
turn this car
around."



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through life make this your goal: Watch the doughnut, not the hole."

It was in the 1930s, too, and half a country away from Levitt's busy Harlem bakery, that a Frenchman named Joe LeBeau made his way up from New Orleans to Paducah, Kentucky. Probably the hard times led him to sell his secret recipe (written out longhand on a slip of paper), and the name Krispy Kreme, to a local store owner named Ishmael Armstrong, who hired his nephew, Vernon Rudolph, and put him to work selling the treats door-to-door.

In 1937 young Vernon and two friends found themselves in Winston-Salem, North Carolina, with just $25 between them. They borrowed ingredients (potatoes, sugar and milk) from a kindly grocer, stripped down to survive the heat of baking in July, and emerged with a fresh batch of Krispy Kremes, which they delivered in their 1936 Pontiac. That year, Joe Louis was heavyweight champ, Amelia Earhart disappeared over the Pacific, the Golden Gate Bridge was completed, and a popular song was proclaiming that you can live on doughnuts and coffee if "you're in love."

North Carolinians soon found their way to Rudolph's operation, and because it's hard to stay wholesale when the fragrance keeps issuing retail flyers for every batch, Rudolph, like Levitt before him, boosted local sales by letting the public see, as well as buy. Krispy Kreme still uses this wholesale/retail system, selling to grocery stores and to passersby who watch for the neon "Hot Doughnuts Now" sign to light up, signaling a fresh batch.

War seems to be a powerful stimulant to doughnut consumption. After all, doughnuts enlisted for World War II just as in World War I. Red Cross women, later known as Doughnut Dollies, doled them out. In his 1942 Army musical, Irving Berlin romanticized the doughnut further with a soldier who loses his heart at Broadway's Stage Door Canteen and eats his way through some anxious waiting: "I sat there dunking doughnuts till she caught on." Not surprisingly, Vernon Rudolph returned from military duty with thoughts of expanding his doughnut chain. And it was right about then, in the early 1950s, that the first Ring King started churning away in the back room.

By the late 1950s, in 29 Krispy Kreme store-factories in 12 states, individual Ring Kings like the Smithsonian's model were turning out something like 75 dozen doughnuts an hour. They faced stiff competition. Dunkin' Donuts, started in Quincy, Massachusetts, in 1950, has been flourishing ever since. By the early 1980s, the Ring King Jr. was obsolete; a fond memory for doughnut aficionados, it was replaced by newer and more elaborate equipment. Sadly, for a while there, the doughnut itself seemed to be going into decline, especially in New York where it was being challenged by the more urbane bagel. But my friends and I, doughnut-deprived college students in a small North Carolina town, thought nothing of a 20-mile journey to Charlotte at 1 A.M. for solace: coffee steaming on the counter, the usual night owl clientele, and fresh Krispy Kreme doughnuts.

Doughnut consumption figures do not encourage nutritionists, who like to point out that a doughnut can carry a 300-calorie wallop.

These days the redoubtable doughnut, made by Krispy Kreme and others, is riding high. Krispy Kreme stores, long best known in the South, are spreading North and West, and sales climbed 20 percent in 1997. Last February, the *New Yorker* described the Manhattan store as a "shrine" and once more detailed the doughnut-making process. (The new machines make 800 dozen doughnuts an hour—more than ten times as many as the Ring King Jr.—but still use the secret formula and doughnut mixes shipped from Winston-Salem.) Dunkin' Donuts has stores in twice as many states as Krispy Kreme, and in 37 other countries, and sells nearly five times as many doughnuts worldwide. In the United States alone, about 10 billion doughnuts are made every year, a mere 1.1 billion by Krispy Kreme. Small wonder one sees reprints of Robert McCloskey's famous children's book *Homer Price*, in which a major figure is a doughnut-making machine that runs amok.

Doughnut consumption figures do not encourage nutritionists, who like to point out that the average doughnut can carry a 300-calorie wallop, notable mainly for its sugar and fat. In fact, a recent issue of the *New England Journal of Medicine* bemoaned the unsaturated fat purveyed by the glazed doughnut. Famous chefs generally deplore the doughnut. But neither science nor culinary scorn nor outright scolding deters devotees, who variously describe Krispy Kreme's hot "original glazed" doughnut with terms like "angelic" or even "sugar-coated air."

David Shayt is one of the collections managers in charge of the Smithsonian's ongoing (and never ending) effort to acquire for the future significant artifacts from American technology and culture, so that the future will have a permanent record. For him and his colleagues, the old Ring King Jr., though it is now retired to storage, is as significant as a Colonial cast-iron cooking pot also in the Smithsonian collection, only more complex. Shayt is pleased that the Institution also has in storage four empty paper sacks each labeled with the proper ingredients for Krispy Kreme doughnuts. "In 800 years, if America should lose the art of making doughnuts," he says, "we could help reconstruct how to do it." Maybe so. But to date nobody but Krispy Kreme has Joe LeBeau's secret recipe. That stays locked up in a safe in Winston-Salem.

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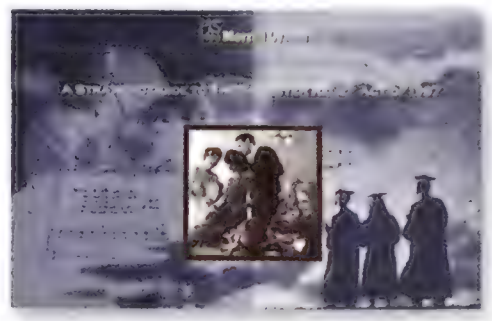

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Backstage at the Museum

BEHIND THE SCENES, AN EXPERT UNITES TEAMS AND BUDGETS, TREASURES AND CASES—REALITY AND DREAMS

BY MICHAEL KERNAN

NEXT TIME YOU'RE IN the new Janet Annenberg Hooker Hall of Geology, Gems and Minerals, over at the National Museum of Natural History, take a careful look at the stands inside the exhibit cases.

You'll see that the various spectacular minerals, crystal clusters and rare stones are presented on pedestals of differing heights. Then be sure to check out the labels, which are printed on little pieces of plastic tilted for easy reading. The ones at the bottom are at a 30-degree angle off the horizontal, the middle ones are at 60 degrees and the ones near eye level are vertical. Simple but ingenious.

Someone planned all that.

Exhibits supervisor Charles Noble coordinates the work of designers, curators and artisans to create displays at Natural History.

Behind the walls of the museum exhibits, behind the series of chambers familiar to the visiting public, is another world, a world of woodshops and studios and corridors lined with complicated machinery for lifting heavy things and moving them around. People spend their careers in this world. You rarely see them, but they are the ones who make the museum what it is.

Charles Noble is virtually a born cabinetmaker.

For as long as he can remember, he has worked with wood. "My father laid the foundation for what I do today," he reflected. At 5, he would hold the tools for his father, a carpenter back in Natchez, Mississippi, and he started taking shop in the eighth grade, before he even got to high school. Then he worked for his dad in the summers until, as a teenager, he joined the Navy Seabees.

These were the famed construction battalions that built airfields out of coral in the Pacific Islands during World War II. In Noble's day, the mid-'70s, the Vietnam War was over and the services were cutting back, so after he completed his Seabee training he wound up as a roadie with the U.S. Navy Band.

"I got to do some carpentry, but it was mostly stage setups and taking care of equipment," he said. "When I got out of the Navy I decided to stay in Washington awhile."

He worked for the Smithsonian bicentennial projects in 1976, apprenticed for the union, worked for Giant stores and on construction jobs at Capital City Woodworking, then found his way to the Freer Gallery of Art. For six years he reveled in the precision cabinetwork required for the beautiful exhibit cases and other new features of the museum.

Three years ago he came to Natural History.

"The demolition for the Gem Hall was going on when I got here," he said. "I had to run to keep up with it. And then they put me into administration."

It's a familiar story: you excel at your craft, they put you in administration. Noble misses the hands-on work, the feel of wood, and he remembers fondly the fine cabinets in walnut that he made for the Freer. But he has taken to his new career with gusto. Working with eight cabinetmakers and two finishers, he created a good deal of the new hall. Now his crew can catch up on maintenance all over the museum. It does tend to fall behind when a major job is going on. Still ahead for his department is the completion of the hall's rocks gallery, and after that there is the new "African Voices" show to prepare for.

By the way, the difference between a carpenter and a cabinetmaker, he

6:42 p.m. San Francisco
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explained, is that a carpenter works to within about an 8th of an inch and a cabinetmaker to within a 32nd of an inch. A finishing carpenter, who falls somewhere between, specializes in trim work.

As exhibits supervisor, Noble coordinates the various teams working on a project, schedules outside contractors, orders materials, handles personnel and budgeting, and generally keeps everyone's eye focused on what is feasible and realistic, amid the dreams of designers.

"We have that a lot," he told me, "things put on paper that can't be done. They'll design a door with no way to open it. Or something might be unsafe. Sometimes we have a problem with live insects in cases: you have to find a way to keep them alive. We do catch a lot of stuff in the design phase, but some things you just have to go back and redesign."

He showed me several drawersful of blueprints, stacks of drawings four inches thick, just for the hall's exhibit cases. One blueprint showed a freestanding "treasure case" nine feet tall, a feature of the so-called fast track for those who want to walk quickly through the hall without having to spend too much time with every rock. There is another set of drawings for interiors, and still another set for the stands and for whatever else goes inside the case. Plus blueprints for labels and graphics.

"We have a core team for every project," Noble said. "On this one we had an outside designer but we also used our own design office. The core team includes curators of the exhibit space, people from the admin' and financial offices, and some others. We here in exhibits review the package from the production point of view and give our input. Then it goes back and forth between the various departments until it's ready."

We left Noble's office and went through the graphics lab, where six designers were making labels and

"The fiberglass dome was made in quarters and put in place piece by piece."

signs, and on through the great backstage corridors of the museum to the hall itself and the spectacular domed room at its entrance where the Hope Diamond is enshrined.

"Almost everything in this room was contracted," Noble told me in his soft voice. "It was my recommendation not to try to do it ourselves. The fiberglass dome was made in quarters and put in place piece by piece."

I couldn't see a single seam.

"This hall was stripped to the bare walls when we started. It overlooked the dinosaur hall—there used to be a balcony here where you could look down on the dinosaurs—so we had to put a plastic bubble around the whole thing to keep the dust down while we were building it."

In this room and the next, most of the major work was done by outsiders, though Noble worked closely with them, suggesting changes to his production chief, Rena Selim. "She made the actual decisions on things like the panels, the ceiling and floor, the look of the place," he said.

The intricacy of the various arrangements staggered me. At every step, the different elements of the hall had to be measured against each other. For instance, Noble's people put together the Italian laminate wall panels while contractors did the grillwork. The museum's own lighting and audiovisual department concentrated on the interactive units.

Here was one of the treasure cases I had seen in blueprint downstairs. A contractor provided the glass; Noble's people built the cases; security put in the alarm, and finally Noble loaded the cases onto the buildups and stands that they had made.

Each buildup, or pedestal, was unique in height and width, matched to the object that would rest upon it. Noble's staff built a mock-up of a display case and pedestals, and the core team was called in to decide in detail what would go where, and how high.

This is not a simple thing. It is akin to legislating taste.

"The design process is not a short one," Noble said dryly. "That's why the core team is kept to a minimum. There are problems all the way: you can't put that label here; this specimen is so high it blocks out that one; the layout emphasizes the wrong piece, and so on."

Then there were the signs. Some had to hang in midair to attract people coming through on the fast track. But because the signs contained information on both sides, the angle they hung at was crucial.

And even tiny errors can create big headaches. "The bases of these cabinets were ordered from outside," Noble told me. "They were all different lengths, and they had to fit the space just so. I messed up there; I typed in 6 pieces instead of 36, and at the last minute we found we were going to run short. Man, there was no way we could get the other pieces in time. So we made some black base parts so you wouldn't notice until the new ones arrived."

Well, I looked at the spot, and I couldn't see any difference.

As Noble disclosed quietly, "I worry about a lot of stuff that nobody else does."

In fact, the entire hall smacked of illusion and sleight of hand. A lot of the "glass" isn't glass but plastic. And when I looked up in most galleries, I saw only darkness. But that is where the majority of the maintenance lines run, the electric cables, air vents and heating ducts, not to mention the welter of baby spotlights and diffusion lights that emphasize what needs to be emphasized without leaving anything else in the dark.

Noble, who wears his hair in dreadlocks, has just discovered his first gray hair. He is 40.

These kids sure know a lot more than beans.

Marketta Blackburn Farris is one teacher who really knows how to produce results. In fact, she does it by taking her 4th grade social studies class to places like the produce section of their local supermarket. She believes that her students should learn as much from life as they do from books. At the store, she makes them deal with real life problems like working with budgets, analyzing nutritional information, comparing product benefits and using their math skills to determine the best bargains. For showing her students that life is a learning experience, State Farm is proud to present Marketta Blackburn Farris with our Good Neighbor Award and to donate $5,000 to the Camargo Elementary School of Mount Sterling, Kentucky.

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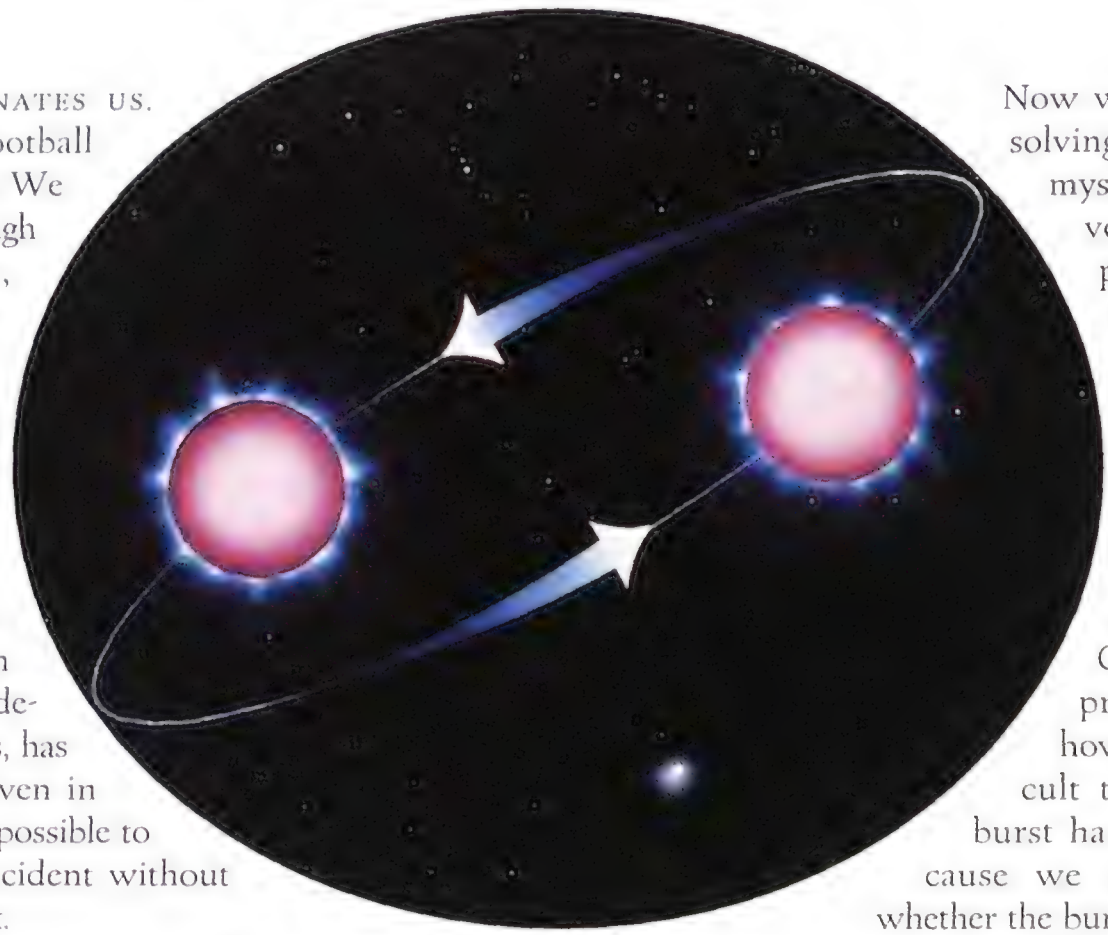
More Violence Overhead

BURSTS OF GAMMA RAYS HAVE BEEN A MYSTERY FOR 30 YEARS; NOW, WITH NEW SATELLITES, WE HAVE SOME CLUES

BY JOHN P. WILEY, JR.

VIOLENCE FASCINATES US. We watch football and stock car racing. We can't seem to get enough of "action" movies, with their car chases and stuntmen crashing through windows and people being killed up close and personal. Sporting names like *Jaws & Claws*, a new breed of animal shows, in which predators are depicted as crazed killers, has reached television. Even in real life, we find it impossible to drive by a serious accident without slowing down to look.



One scenario for the gamma ray bursts has two neutron stars whirling in a dance of death as they spiral in toward each other and eventual destruction.

Astronomers see violence on a, well, astronomical scale. We've known for a generation just how violent a place the Universe is. Before that, we had known about novas, stars that blow off their outer shells, and supernovas, stars that simply blow up, leaving only a core behind. Those cores are neutron stars which, when they are oriented just so, are also the pulsars that so excited the world when they were discovered in 1967.

We know that galaxies really do collide, setting off pyrotechnic displays of new, hot stars that form as the gases in those galaxies are compressed. Now, after a generation of theorizing, we think that we have solved the mystery of quasars, faint fuzzy "stars" that emit prodigious quantities of energy. They probably are black holes at the centers of galaxies, pulling in the interstellar gas as well as the stars around them, ripping them apart in the process. As stellar material is accelerated to relativistic velocities by the black hole's gravitational field, it gives off radiation that is more and more energetic, as if the very life were being pulled out of it. That radiation is the "scream" of a star dying a violent death.

Now we're on the brink of solving another 30-year-old mystery, one that also involves the release of prodigious amounts of energy. Military satellites were the first to see what are called "gamma ray bursts" (GRBs), seconds-long eruptions of photons even more energetic than x rays. Gamma rays do not produce sharp images, however, so it was difficult to pinpoint where a burst had occurred. And because we had no clue as to whether the bursts were happening in our own galaxy or in other, distant galaxies, we did not appreciate just how powerful the bursts really are.

The tempo picked up in 1991 when the Compton Gamma Ray Observatory was launched. It carried an apparatus specifically designed to detect and locate GRBs. It saw about one a day, and it saw them in all directions: they were not concentrated along the Milky Way, our home galaxy. This suggested they were happening outside our galaxy, very far away. In 1996 an Italian-Dutch satellite called BeppoSAX carried a GRB monitor and x-ray cameras and telescopes that would detect the gamma rays themselves, and locate the bursts by means of the x rays that were suspected to stream from them in an afterglow. Using BeppoSAX, astronomers located their first GRB on January 11 of last year. On February 28, they detected a burst for which, for the first time, an optical counterpart was found: a glow of visible light. After another burst on May 8, one of the world's most powerful telescopes, at the Keck Observatory in Hawaii, obtained a spectrum that revealed the presence of a large cloud between the light source and Earth, about seven billion light-years away. The

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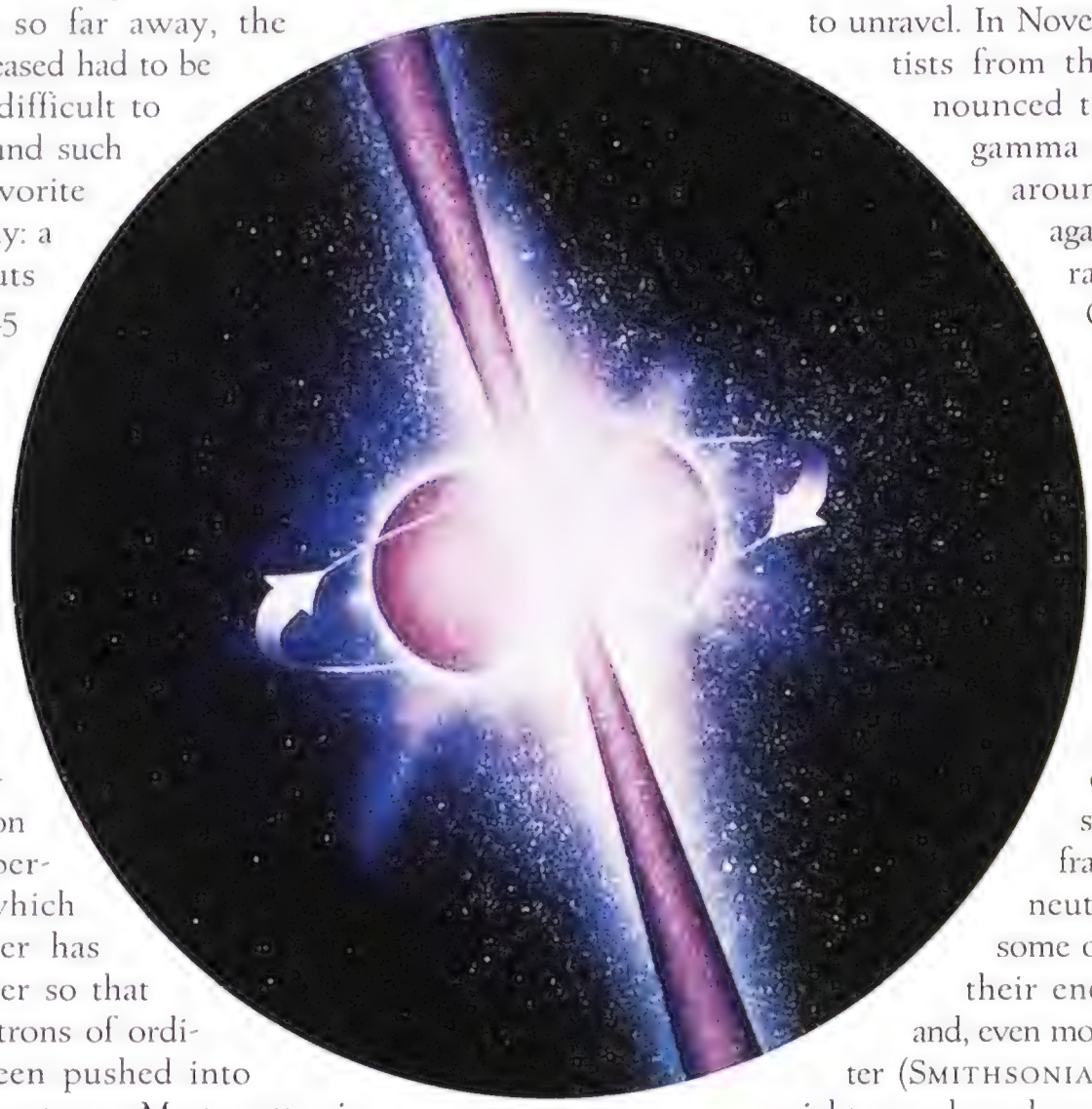
Whether caused by colliding neutron stars or something else, gamma ray bursts release in 15 seconds more energy than the Sun will over ten billion years.



burst we saw on May 8 had actually happened at least seven billion years earlier, long before Earth existed. More important, for the burst to be visible so far away, the amount of energy released had to be extraordinary. It is difficult to wrap our minds around such numbers, but my favorite comparison goes thusly: a gamma ray burst puts out more energy in 15 seconds than the Sun will release in its entire ten-billion-year lifetime.

So we have the same challenge we had with the quasars: show us the mechanism. The leading candidate so far seems to be the violent merging of neutron stars. These are supernova remnants in which the remaining matter has been crushed together so that the protons and electrons of ordinary matter have been pushed into each other to form neutrons. Most matter is almost entirely empty space, but not this stuff: a teaspoonful would weigh several tons. So when neutron stars collide, the kinetic energy is off the scale.

Whatever causes a burst, what we see is the resulting fireball. We cannot see the event itself, because in the fireball's earliest stages, the plasma inside is so dense that no electromagnetic radiation can escape. Only when the fireball has reached out 60 million miles or so, moving at close to the speed of light, do the gamma rays and some x rays escape and we detect a GRB. When it has reached about 60 billion miles, it is thought to collide with interstellar gas, an event that emits more x rays, along with visible-light and radio waves. It was a spectrum of those visible wavelengths that gave us a minimum distance to the burst of May 8. Radio astronomers reported in September that the fireball from that burst was then about a tenth of a light-year across; that represents 170 times the distance from the Sun to Pluto.

Astronomers who had thought the GRBs were close by, in our own galaxy, have been disappointed, but the Milky Way still holds a gamma ray mystery of its own for them to unravel. In November a team of scientists from three universities announced that a huge cloud of gamma rays forms a halo around our galaxy. Once again, we see the gamma rays (courtesy of the Compton spacecraft), but we don't know what is generating them. They don't appear to be coming from discrete sources. Three possibilities are being looked at: high-energy cosmic rays colliding with photons of lower energy light, such as visible or infrared; rapidly spinning neutron stars or pulsars, some of which emit most of their energy as gamma rays; and, even more intriguing, dark matter (SMITHSONIAN, June 1993), which might somehow be producing the gamma rays. Weakly interacting massive particles (WIMPS)—theoretical particles that may constitute dark matter—would be expected not to interact with light. But if they exist and form a halo around our galaxy, it could be that when they collide with each other, they generate either gamma rays directly or paired particles of matter and antimatter that then annihilate in a burst of gamma rays.

Whether you look seven billion light-years away, or just outside our own galaxy, you find gamma rays being produced by what can only be violent processes. The amounts of energy involved dwarf anything we can imagine. Only now are we beginning to get a handle on what's going on. The next step, as always, is more research. In a few years new satellites, with names like HETE (High Energy Transient Explorer), will fly to give us more and better data. Sooner or later, we'll stamp "SOLVED" on the GRB folder. Then, and remember you read it here first, new mysteries will arise.

In the meantime, when you look up on a clear winter night, don't be fooled by the apparent peace and orderliness. It's dangerous out there.

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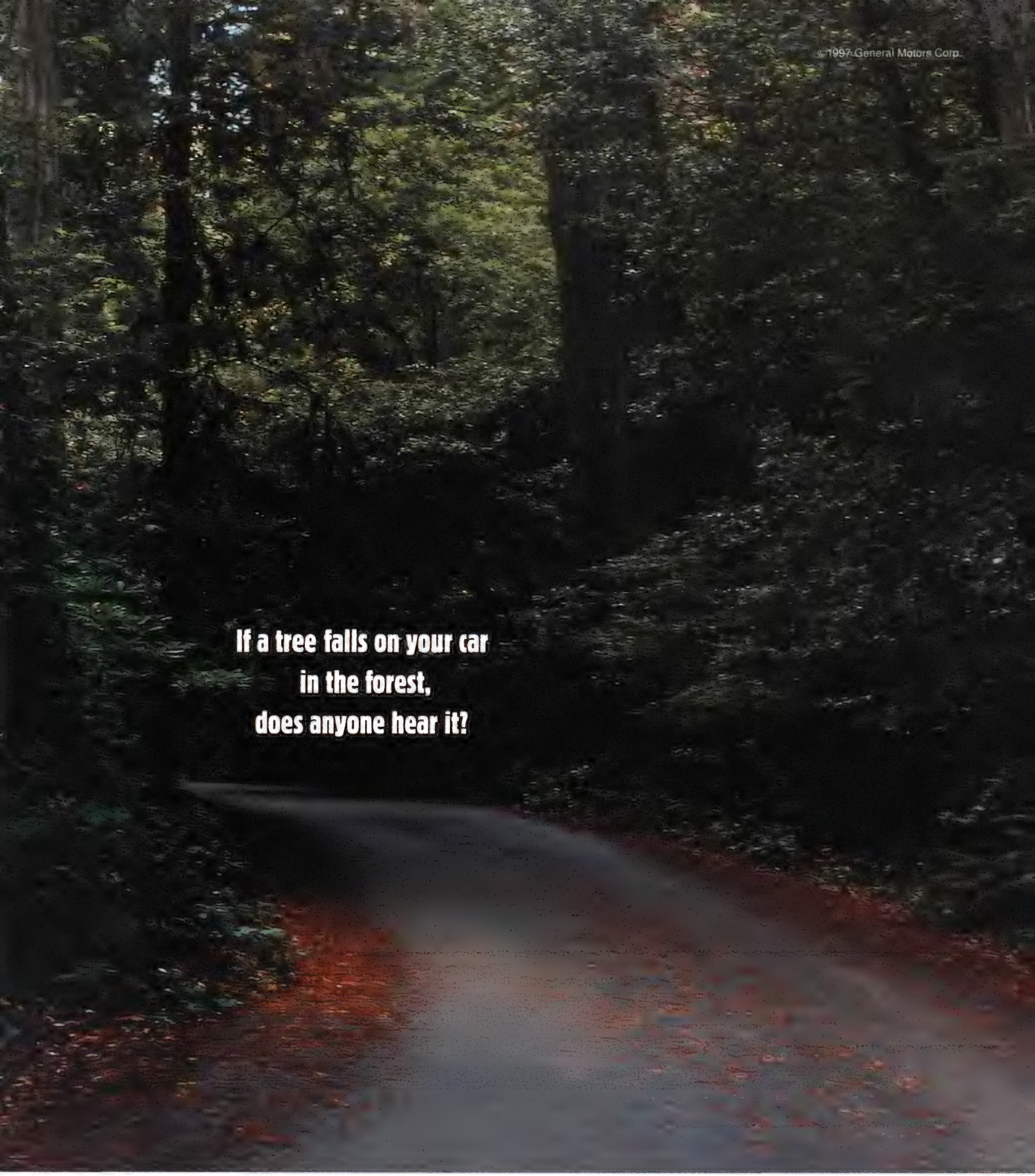

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Olowe of Ise—Sculptor to Kings

SMITHSONIAN HIGHLIGHTS

THOUGH AFRICAN WORKS OF ART HAVE been traditionally identified by the name of the ethnic group that produced them or by a particular style of art, the individual artists who created them were not anonymous. Their names were well known to the people who commissioned artworks and often to the people who saw them. Many artists were noted for their distinctive and recognizable personal styles, and their renown usually reached well beyond their own villages. One such artist was Olowe of Ise. Active during the first quarter of this century in the small town of Ise in southwestern Nigeria, Olowe is considered by many Western art historians to be the most important Yoruba artist of the 20th century. His unique style and remarkable technical skill commanded the attention of Yoruba kings, who commissioned him to sculpt doors and other objects for their palaces.

A major exhibition of the work of this imaginative and highly skilled artist opens March 15 at the National Museum of African Art. On view through September 7, "Olowe of Ise: A Yoruba Sculptor to Kings" features veranda posts, figures, containers, and elaborately carved and decorated doors celebrated for their high, uneven relief. The artist's distinctive hand and exceptional virtuosity are evident in the elongated form and careful detailing of the female figure in the ritual container above (right), and in the opposing geometric patterns of the door panel at left. "An artist of universal appeal," writes NMAfA director Roslyn A. Walker in the show's catalogue, "Olowe of Ise was unique among Yoruba artists and remains without peer." —*Diane M. Bolz*

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Available by prescription only. Not for children or those with glaucoma, difficulty in urinating, or an allergy to scopolamine or other belladonna alkaloids. In clinical studies, some side effects were noted, including blurred vision, dryness of the mouth (in two-thirds of users) and drowsiness (reported incidence less than 1 in 6). While using this product, you should not drive, operate dangerous machinery or do things that require alertness. Avoid using alcohol. If you are elderly, your physician should exercise special care in prescribing this product. See adjoining page for additional information on potential adverse reactions or side effects.

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Brief Summary
(For full prescribing information, see package insert)

INDICATIONS AND USAGE: Transderm Scōp is indicated for prevention of nausea and vomiting associated with motion sickness in adults. The patch should be applied only to skin in the postauricular area.

CONTRAINDICATIONS: Transderm Scōp is specifically contraindicated in persons who are hypersensitive to the drug scopolamine or to other belladonna alkaloids, or to any ingredient or component in the formulation or delivery system, or in patients with angle-closure (narrow angle) glaucoma.

WARNINGS: Transderm Scōp should not be used in children and should be used with special caution in the elderly. See PRECAUTIONS.

Since drowsiness, disorientation, and confusion may occur with the use of scopolamine, patients should be warned of the possibility and cautioned against engaging in activities that require mental alertness, such as driving a motor vehicle or operating dangerous machinery.

Potentially alarming idiosyncratic reactions may occur with ordinary therapeutic doses of scopolamine.

PRECAUTIONS

General: Scopolamine should be used with caution in patients with pyloric obstruction, or urinary bladder neck obstruction. Caution should be exercised when administering an antiemetic or antimuscarinic drug to patients suspected of having intestinal obstruction.

Transderm Scōp should be used with special caution in the elderly or in individuals with impaired metabolic, liver, or kidney functions, because of the increased likelihood of CNS effects.

Caution should be exercised in patients with a history of seizure or psychosis, since scopolamine can potentially aggravate both disorders.

Information for Patients: Since scopolamine can cause temporary dilation of the pupils and blurred vision if it comes in contact with the eyes, patients should be strongly advised to wash their hands thoroughly with soap and water immediately after handling the patch. In addition, it is important that used patches be disposed of properly to avoid contact with children or pets.

Patients should be advised to remove the patch immediately and contact a physician in the unlikely event that they experience symptoms of acute narrow-angle glaucoma (pain in and reddening of the eyes accompanied by dilated pupils). Patients should also be instructed to remove the patch if they develop any difficulties in urinating.

Patients should be warned against driving a motor vehicle or operating dangerous machinery while wearing the patch. Patients who engage in these activities should also be aware of the possibility of withdrawal symptoms when the patch is removed. Patients who expect to participate in underwater sports should be cautioned regarding the potentially disorienting effects of scopolamine. A patient brochure is available.

Drug Interactions: Scopolamine should be used with care in patients taking drugs, including alcohol, capable of causing CNS effects. Special attention should be given to drugs having anticholinergic properties, e.g., belladonna alkaloids, antihistamines (including meclizine), and antidepressants.

Carcinogenesis, Mutagenesis, Impairment of Fertility: No long-term studies in animals have been performed to evaluate carcinogenic potential. Fertility studies were performed in female rats and revealed no evidence of impaired fertility or harm to the fetus due to scopolamine hydrobromide administered by daily subcutaneous injection. In the highest-dose group (plasma level approximately 500 times the level achieved in humans using a transdermal system), reduced maternal body weights were observed.

Pregnancy Category C: Teratogenic studies were performed in pregnant rats and rabbits with scopolamine hydrobromide administered by daily intravenous injection. No adverse effects were recorded in the rats. In the rabbits, the highest dose (plasma level approximately 100 times the level achieved in humans using a transdermal system) of drug administered had a marginal embryotoxic effect. Transderm Scōp should be used during pregnancy only if the anticipated benefit justifies the potential risk to the fetus.

Nursing Mothers: It is not known whether scopolamine is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when Transderm Scōp is administered to a nursing woman.

Pediatric Use: Children are particularly susceptible to the side effects of belladonna alkaloids. Transderm Scōp should not be used in children because it is not known whether this system will release an amount of scopolamine that could produce serious adverse effects in children.

ADVERSE REACTIONS: The most frequent adverse reaction to Transderm Scōp is dryness of the mouth. This occurs in about two thirds of the people. A less frequent adverse reaction is drowsiness, which occurs in less than one sixth of the people. Transient impairment of eye accommodation, including blurred vision and dilation of the pupils, is also observed.

The following adverse reactions have also been reported on infrequent occasions during the use of Transderm Scōp: disorientation; memory disturbances; dizziness; restlessness; hallucinations; confusion; difficulty urinating; rashes and erythema; acute narrow-angle glaucoma; and dry, itchy, or red eyes.

Drug Withdrawal: Symptoms including dizziness, nausea, vomiting, headache, and disturbances of equilibrium have been reported in a few patients following discontinuation of the use of the Transderm Scōp system. These symptoms have occurred most often in patients who have used the system for more than three days.

OVERDOSAGE: Overdosage with scopolamine may cause disorientation, memory disturbances, dizziness, restlessness, hallucinations, confusion, psychosis, convulsions, bronchospasm and respiratory depression, and muscular weakness. Should these symptoms occur, the Transderm Scōp patch should be removed immediately, adequate hydration should be maintained, and appropriate symptomatic treatment initiated.

CAUTION: Federal law prohibits dispensing without prescription.

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SMITHSONIAN HIGHLIGHTS

Planning a Smithsonian Visit?

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Smithsonian museums are generally open 10 A.M. - 5:30 P.M. daily, except December 25. Hours at the National Zoo are 10 A.M. - 4:30 P.M. daily (buildings) and 6 A.M. - 6 P.M. (grounds).

The Smithsonian home page on the World Wide Web (www.si.edu) offers on-line information about exhibitions, collections, events and products.

Special March Exhibitions, Events

SMITHSONIAN KITE FESTIVAL

Kite enthusiasts will gather at the Washington Monument on Saturday, March 28, for the 32nd annual Kite Festival, cosponsored by the Smithsonian Associates and the National Air and Space Museum. (Rain date: Sunday, March 29.) Call 202-357-3050.

NATIONAL MUSEUM OF AFRICAN ART

Olowe of Ise: A Yoruba Sculptor to Kings (March 15-September 7) African art masterpieces by the early 20th-century

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Yoruba carver include the museum's high relief "Palace Door." See page 34.

FREER GALLERY OF ART

The Seven Thrones of Jami: A Princely Manuscript from Iran (through March 29) Illustrations from a 16th-century Persian mystical poem by Jami.
In the Mountains (through August 2) Exhibition explores the depiction of mountains in Chinese art.

ARTHUR M. SACKLER GALLERY

Sakhi: Friend and Messenger in Rajput Love Paintings (March 8-July 7) Paintings created in northern India between the 17th and 19th centuries highlight the role of the *sakhi* as confidante and messenger in Rajput love paintings.
Poetic Landscapes: Two 17th-Century Chinese Albums (March 8-July 5) Display showcases two Ming Dynasty albums: "Eight Views of Xiao-Xiang" and "Landscapes Inspired by Tang Poems" by Liu Yu.

NATIONAL AIR AND SPACE MUSEUM

Star Wars: The Magic of Myth (through November 1) Exhibition commemorating the 20th anniverary of the film trilogy features original props, models, costumes and artworks. Free timed same-day tickets are available only at the museum's ticket desk. Advance tickets are available through ProTix for a service charge of $2.25 per ticket (1-800-529-2440). For general information, call 202-786-2122.
Space Race New permanent display traces the competition in space between the United States and the former Soviet Union.

NATIONAL MUSEUM OF AMERICAN HISTORY

Ella Fitzgerald: First Lady of Song (opens March 19) Exhibition features a sampling of personal artifacts, donated to NMAH last year, that document the famed singer's extraordinary career—costumes, sound recordings, scrapbooks, sheet music, photographs, awards.

My eyes widen, my jaw drops, my hands clutch at the rail. (A perfectly natural reaction, the park ranger tells me.)

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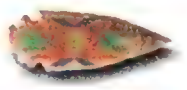

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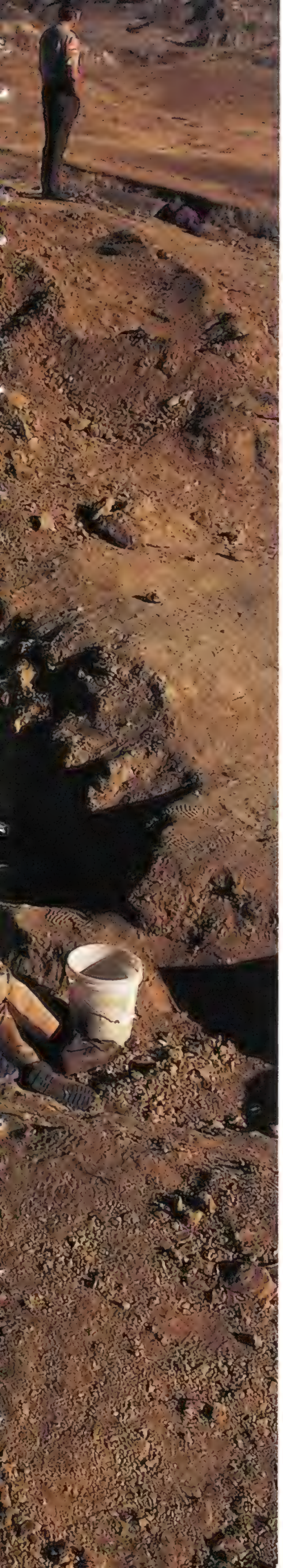
Keith Rigby (in plaid shirt) and Earthwatch volunteers and locals dig out a fossil T. rex from a butte in Montana. Right: Rigby examines bones in his Fort Peck lab.



Digging for Dinosaur Gold

A COMPLICATED BATTLE OVER ONE FOSSIL *TYRANNOSAURUS REX*—AND THE HIGH-STAKES AUCTION OF ANOTHER—RAISES A BIG QUESTION: WHO GETS TO OWN THE BONES?

"WELL, NATE," SAID THE RANCHER TO the scientist, "if we don't get one of you guys to come along, we're going to go up there by ourselves and rip that SOB out of the hill!"

Thus Nate Murphy, director of paleontology for the Phillips County Museum in Malta, Montana, found himself face-to-face with a dilemma virtually unknown in the history of his profession. The man soliciting his aid was Fred Walton, the down-on-his-luck descendant of a pioneer Montana ranching family. The "SOB" Walton hoped to dig out of the hill was quite possibly the largest *Tyrannosaurus rex* ever found.

It was September 1997. About two months earlier, a team of dinosaur hunters led by Keith Rigby of the University of Notre Dame had discovered the *T. rex* emerging from the eroded shoulder of a low butte in McCone County, in the desert badlands of northeastern Montana. For 16 years, Rigby had worked these hills, which are prime dinosaur country. As the team dug into the dirt, uncovering more and more of the fossil, Rigby began to suspect that he had stumbled not only upon the find of his career but upon one of the most important dinosaur discoveries of the century.

Rigby's team—composed of Notre Dame students and volunteers from the Earthwatch Institute, a nonprofit organization based in Watertown, Massachusetts, that supplies funding and amateurs to work on scientific projects in the field—was on a tight schedule, and the professor himself was due back at Notre Dame to teach the fall term. There wasn't time to extricate more than a fraction of the tyrannosaur. At the end of his field season, in late August, Rigby reluctantly backfilled the dig, planning to complete

BY DAVID ROBERTS ▪ PHOTOGRAPHS BY TED WOOD

Steve Walton, seen here with son Sheridan and wife Connie, disputes the government's position on the dinosaur's ownership.

his excavation the following summer. Fearful of looters, he swore his workers to secrecy.

The arid clay bluffs and arroyos where Rigby toiled make up a hardscrabble patchwork of land on which, since before the turn of the century, various members of the extended Walton clan had tried to eke out a living as ranchers. Fred Walton's father lies buried in a lonely grave guarded by a chain-link fence less than half a mile from the site of the *T. rex* find. For two years, Walton had told Rigby that the section of land where the colossal dinosaur reposed was Walton land. Now he told Nate Murphy the same thing.

This puzzled the local paleontologist. "What's the big hurry?" he had asked Walton in a discussion a few days earlier. The rancher, according to Murphy, muttered vague aspersions about not trusting Rigby, then admitted that his family faced a court hearing. Unable to make payments on their mortgaged property, the Waltons feared the Farm Service Agency (FSA) would take the land—and, presumably, whatever was buried in it—from them.

Still, Murphy had been leery of cooperating. "There's an unwritten rule in paleontology," he would later say. "You don't mess with another guy's dig." He had urged the Waltons to negotiate with Rigby. Now, in light of Fred Walton's assertion, Murphy insisted on consulting Rigby himself. The Waltons gave him a South Bend, Indiana, phone number, which Murphy tried several times, getting neither Rigby nor an answering machine. No wonder, Fred Walton volunteered: Rigby was off in Mongolia, looking for Chinese dinosaurs.

The distraught Murphy called Bob Bakker, curator of dinosaurs at the Tate Museum in Casper, Wyoming, for advice. One of the country's leading dinosaur experts, Bakker sympathized with Murphy's quandary. Since Rigby was indeed unreachable, Bakker finally urged, it would be better to direct the removal of the fossil and use professional techniques than to stand by and let the ranchers brutally wrench the bones out of the ground, losing much of the dinosaur's scientific value in the process.

THE PALEONTOLOGIST STALLED FOR TIME

AT 8 A.M. ON SATURDAY, SEPTEMBER 13, SEVERAL WALtons joined a small team of experienced volunteers assembled by Murphy at the site. Using a tractor, the ranchers dug away six feet of backfill. To protect himself, Murphy insisted on videotaping the whole operation. By midafternoon, the skull of the tyrannosaur had been exposed.

Meanwhile, Murphy was growing more and more suspicious. In plain view from Highway 24, the activity at the site drew a visit from a local couple who knew the Wal-

Fred Walton, a member of the clan that claimed the land where the *T. rex* was uncovered, relaxes with his wife and children.

tons. Upon their arrival, Fred Walton and his cousin Steve seemed deeply agitated. The visitors asked if they could take pictures; the Waltons said no.

After the couple left, Murphy heard Fred say to Steve, "We better move our rigs out of sight."

Murphy asked, "Fred, if this is your land, what are you worried about?"

"It's our land, but you gotta remember, this is McCone County. You gotta watch what your neighbors are doing."

"Right then and there," says Murphy now, "I smelled a rat, big-time." The paleontologist decided to stall for time. Having "pedestaled" the stone containing the dinosaur's lower jaws by carving away earth and rock beside and beneath it, he "jacketed" the fossil with burlap and plaster—standard procedure before removing it from the ground. Then he told the Waltons the plaster would take 12 hours to set up.

According to Murphy, it was Fred Walton's turn to grow suspicious. "The plaster those Earthwatch folks used doesn't take that long."

"This is a new type of plaster," Murphy hedged.

The removal was left for Sunday morning—by which time Murphy's team had fled, washing its hands of the operation. Yet the paleontologist failed to notify local law enforcement authorities, or to make renewed attempts to contact Rigby. "I still thought it was all a matter of feuding within the Walton family," he explains.

On Saturday night, after a day of fishing on the Fort Peck Reservoir, Jim Rector, a lawyer in Glasgow, Montana, stopped off for a beer at the nearby Gateway Inn. There he bumped into the inquisitive couple, who told Rector what fun they'd had that afternoon watching a dinosaur being dug up, and described where they'd been.

Rector happened to be a friend and business associate of Rigby's; he had been let in on the secret of the *T. rex*. That night he phoned the scientist, who was in Boston, not Mongolia. An apoplectic Rigby contacted the FBI.

Twice the next day, Rector and a friend drove out to the site to check what was going on. Wary of trespassing on private land, the two men kept an uneasy distance, parking on a nearby road and using binoculars to watch various Waltons puttering about the site carrying firearms.

At one point, according to Rector, Steve Walton walked over to talk to the observers. "What are you guys doing?" he asked.

"Eating lunch," said Rector. "What're you doing?"

"You know what I'm doing."

Rector looked into Steve Walton's face. "What are you going to do with it?"

"I'm gonna save my land and feed my family."

By midafternoon, Rigby's frantic phone calls had mustered action. An FSA agent and the McCone County deputy sheriff drove up to the site and ordered the Waltons off it. The ranchers left peaceably.

The site was confusing: a jumble of bones, which Rigby deduced belonged to different animals.

Exactly what happened that Sunday, September 14, remains the subject of an ongoing FBI criminal investigation. Beyond the immediate drama looms the volatile schism between Western landholders and federal authorities: often last September, seasoned observers thought the situation in McCone County had a chance of exploding into another Freemen standoff or Ruby Ridge shoot-out. And in the long view of scientific inquiry, what Rigby and his helpers uncovered last summer on that barren Montana hill—not only the *T. rex*, but a bizarre array of other dinosaur bones jumbled into the geologic strata with it—has major significance.

T. REX SEIZED THE WORLD'S IMAGINATION

THE FIRST *TYRANNOSAURUS REX* EVER FOUND WAS LOCATed in Wyoming in 1900 by a tireless and flamboyant fossil hunter named Barnum Brown. Brown also found a second and third, in Montana in 1902 and 1907. For another 58 years, these three were the only specimens of the world's fiercest carnivore to be dug out of the ground. Yet thanks in large part to the reassembly and display of the 1907 monster, which became the cynosure of the American Museum of Natural History in New York, *Tyrannosaurus rex* seized the world's imagination.

Even today, *T. rex* is known by only some two dozen examples, the most fragmentary of which amount to a mere 5 percent of the original beast. All the specimens have been found in Montana, the Dakotas, Wyoming and Colorado, and Alberta and Saskatchewan in Canada, although similar dinosaurs have been found in Asia and South America. In western North America the geologic strata that were laid down some 65 million to 67 million years ago—during the late Cretaceous era when *T. rex* roamed—are now being exposed to the air. In the ground, dinosaur bones can remain exquisitely preserved across unimaginable spans of time; but once they start coming out of the hillside, they can crumble to dust in a mere 25 years.

The discovery last summer was made not by Rigby himself but by an Earthwatch volunteer, Louis Tremblay. A ninth-grade earth sciences teacher from Avon, Connecticut, Tremblay had been tutored by Rigby on a previous dig. The original agenda last July was to get a large hadrosaur—a plant-eating duck-billed dinosaur—out of the ground. While most of the team toiled over this fossil, Rigby and four volunteers went prospecting, walking the dusty hills around the dig in search of bones emerging from the ground.

On his first day in the field, Tremblay came across tiny bone fragments, each only an inch or so long, lying on the slope of a hill about a quarter-mile from the hadrosaur. "Doc Rigby had taught me," recalls Tremblay, "that when you find fragments, you work up the hill, looking for the place where they're coming out of the ground. But usually you're not successful at finding the source."

This time, however, Tremblay came upon a bone imbedded in the ground, protruding some two inches. He told Rigby, who showed only a perfunctory interest in the discovery. "Follow it and see where it takes you," he instructed Tremblay, without even bothering to walk over to examine the bone.

For several days, Tremblay and another volunteer carefully scraped the dirt away from what would turn out to be a *Tyrannosaurus* rib. Then Tremblay found what he thought was a claw—one of the pincer-like fingers attached to the end of a *T. rex*'s surprisingly small arms. At last Rigby came to look. Sure enough, the fossil was a sharp, narrow claw: thus the dinosaur was a carnivore. The team dug deeper. But the site was a confusing jumble of bones, which Rigby eventually deduced belonged to a number of different animals. The bones lay imbedded, in Rigby's phrase, "like giant toothpicks stuck in a four-ton marshmallow," in the stony concretions that had hardened around them over the ages.

By the end of the summer, Rigby's team had removed a number of bones, including a colossal pubis (a piece of the dinosaur's pelvis). Rigby measured its length at 52 inches—at least as large as that of any predatory dinosaur previously found. The team had also exposed the giant's skull, in diagnostic terms by far the most important part of the beast, as well as its iconic signature—the low forehead, brutish snout and huge ravening jaws that have given three generations of kids thrills and nightmares.

For three years, Fred Walton had watched and worked alongside Rigby on this and other sites. The paleontologist had hired Fred's wife, Faye, to cook for the teams, and he paid his 9-year-old son John to mow the lawn around his field station in Fort Peck. Word of the Waltons' financial troubles, however, was rampant around town. Rigby had begun to wonder if the Waltons indeed owned Section 22, the land where the *T. rex* was found. But when he left Montana at the end of August, having backfilled the site, burying the priceless skull and most of the rest of what he was beginning to think might be the world's biggest *T. rex*, Rigby still trusted Fred Walton enough to leave him a

Clockwise, from upper left: Steven Begin, Curtis Padilla and Pat Dunn lift bones still encased in rock; Corrinne Sosso digs beneath backhoe tracks to see if any bones lie below that level; Dunn, the "Human Backhoe," digs a trench to provide access to bones; Louis Tremblay, who discovered the *T. rex*, works on the upper jaw area.

I marveled at the exquisite efficacy of Darwinian natural selection, which had lined these killer teeth with fine parallel serrations, the better to rend Cretaceous flesh.

set of keys to his field station. And he asked the rancher to keep an eye on the bones stored in its basement.

I arrived in Montana on September 23, the day before Keith Rigby showed up to launch what had become, in the full glare of media attention, an emergency rescue of the gigantic dinosaur. One week before, just two days after the FSA and the county sheriff had chased the Waltons off Section 22, local paleontologist Nate Murphy had been hired to rebury the looted site. Murphy's worst fears were confirmed: the lower jaws, which he had jacketed three days before, were gone.

WHOSE LAND WAS IT, ANYWAY?

AT THE END OF THE SUMMER, AN INCREASINGLY DUBIous Rigby had decided to launch a title search on Section 22. He had learned that, three years earlier, after failing to make a number of mortgage payments, the Waltons had deeded the land to the FSA, in lieu of foreclosure. The Waltons no longer owned Section 22: instead, the federal government did.

This meant a whole new headache for Rigby. Having believed the rancher's assertion of ownership and received his permission to dig, Rigby now realized he had performed a technically illegal excavation, for he had no permit to work on government land. But now the site had been looted, amid rumors that a shady buyer had offered Fred Walton $1.8 million for the prize *T. rex*. The FBI had entered the case. Initially, there was considerable sympathy for the Waltons: an apparent technicality had robbed them of the treasure that could have solved all their decades of financial woe. Once more it looked as though the feds were muscling in on desperate Westerners just trying to wring a living from the land.

The dinosaur, however, had to be saved. After much pulling of strings by Notre Dame and Earthwatch, the FSA issued Rigby a permit, allowing him to excavate only the *T. rex* his team had found in July and the stray bones intermingled with it.

It was Indian summer in Montana, the stunted cottonwoods in the shallow draws expiring in a blaze of yellow leaves, the perpetual west wind cutting the heat of an equinoctial sun. Atop the clay hill on Section 22, a small crowd of workers and journalists watched Rigby's ace backhoe operator, Manson Bailey III, delicately carve away the backfill he had deposited the previous week. "I think, if asked," said Rigby admiringly, "Manson could probably turn the pages of a book with that machine."

Fifty years old, Keith Rigby is a big, burly man who has been told that he bears a passing resemblance to Colonel Sanders. A Mormon who neither smokes nor drinks, he wields a salty tongue while deftly sidestepping true profanity. (When I relayed to him a Fred Walton remark, he exploded, "My sister's black cat's rear end!")

Now Rigby speculated as to the events of "66 million years ago, give or take a weekend" that had jumbled together the bones of animals not normally found in the same place. "This whole deposit may have been a stream channel. A flood probably washed all these dead dinos into this spot." He continued, "To get predator and prey—hadrosaurs were *T. rex* prey—in the same hole in the ground is very unusual."

By midafternoon, Bailey's surgical digging had exposed the black tarp with which, a week earlier, Nate Murphy had covered what remained of the skull. Rigby and a helper gingerly lifted the tarp.

"Oh, man!" wailed the scientist. "It's gone to hell!"

To my untutored eye, what lay in the ground looked like a bunch of mottled rocks: it was hard to tell where stone left off and bone began. But Rigby was beholding a paleontological disaster.

"Oh, man," he groaned softly, and pointed. "They broke *that*, they broke *that*." The crowd around him held its collective breath. "They destroyed the skull to take the jaws," Rigby summarized. "That was exactly what I was afraid was going to happen."

In the midst of catastrophe, there was some good news. The FBI had recovered the jaws in Great Falls, Montana, some 300 miles west of Section 22. So far, surprisingly, the FBI had not formally questioned the Waltons. As I poked around Glasgow and Fort Peck, I discerned less sympathy

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Nate Murphy, director of paleontology at the Phillips County Museum, found himself face-to-face with a dilemma virtually unknown in the history of his profession.

for the impoverished ranchers than I had expected, and considerable outrage at what had happened to a dinosaur that, in the view of many locals, belonged to everybody in northeast Montana.

A court-appointed lawyer had ordered the Waltons not to talk to reporters. But after I made repeated phone calls, Fred Walton invited me out to his place. I drove county roads to a bend of bottomland beside the Milk River. The ranch looked as though it might once have been prosperous, but now its fields lay fallow. Walton greeted me on the porch of his trailer home.

"You stay for dinner?" he asked. I hesitated: it was only 11 A.M. It turned out "dinner" meant "lunch." He put a pair of fat hamburgers on a grill and started basting them with a homemade barbecue sauce. The 44-year-old rancher had a weather-creased face, his gray eyes narrowed in a squint. He wore cowboy boots, a black denim shirt, a black cowboy hat and a flashy silver belt buckle with rifle cartridges welded to it. "I'm extendin' to you a lot of Montana hospitality," he said as he idly turned the burgers, chain-smoking and gazing into the distance.

"It don't worry me in the least," he said, when I asked about the publicity swirling about his deeds on Section 22, including a piece in the current *Newsweek*. Then, a moment later: "They say everybody has their 15 minutes of fame. I've had my time and a half. Shut it down! Put a cap on it!"

For hours, Walton's monologue meandered around the edges of what had happened on the weekend of September 13-14. But at last we neared the subject. Pulling out dog-eared papers, Walton unleashed a tirade about the land dispute: the FSA action was really a "voluntary liquidation"; his uncle wasn't of sound mind when he signed the documents; the FSA had stolen his livestock. He voiced his bottom line: "Until the middle of December [the date of the upcoming hearing], it's Walton land."

Yet as I began to ask about the crucial weekend, Walton said, "I was digging up there to find out if somebody had stolen something from us. All we were guilty of is curiosity. I didn't take the jawbones. I was as surprised as anybody when we found them gone."

A few days later, after several false starts, I won an audience with Walton's cousin Steve. At home were Steve Walton, his wife, Connie, their 7-year-old son, Sheridan, and Steve's brother Pat Walton. Thirty-six years old, Steve Walton seemed to be a gentler, more melancholy fellow than Fred.

Our meeting began with another flurry of dog-eared legal documents. As I listened to these Waltons' plaints, I felt that hardship had bred a kind of collective persecution complex into the Walton clan. "I think they knew there was a dinosaur up there about ten years ago," said Pat Walton bitterly. "They just wanted to evict us."

About such agencies as the FSA, Steve Walton was matter-of-fact. "They've been trying to starve us out for years." Summing up the land dispute, he said, "As far as we know, it's still our property, our dinosaur, and we need the money."

I asked him if he'd bargained for the kind of trouble he was in. He smiled bleakly. "I'm not in any worse trouble than I was years ago. The biggest trouble I'm in right now is losing this land."

FIRST, GET IT OUT OF THE GROUND

FOR THE BETTER PART OF TWO WEEKS LAST SEPTEMBER and October, Rigby and his hastily assembled team of workers pulled the giant dinosaur out of the ground. Each rough-stone concretion would have to be carved, chiseled and brushed away in the lab to reveal the fragile bones, which would then be coated with a hardening liquid called Vinac.

As I lingered about the site, I became a paleontological dilettante: soon I was able to see the telltale dark smear of

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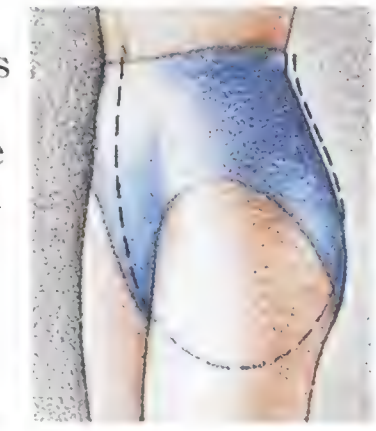

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At Sotheby's in New York, *T. rex* "Sue" watches David Redden bring in the $7.6 million winning bid; Joe Tippmann of the Black Hills Institute made the model of Sue (inset).

bone cooked into the stone that trapped it. With the upper jaws still in the ground, Louis Tremblay had picked and brushed dirt away until several foot-long teeth lay fully exposed. Peering close, I marveled at the exquisite efficacy of Darwinian natural selection, which had lined these killer teeth with fine parallel serrations, the better to rend Cretaceous flesh.

One Sunday, Rigby held an open house for the community. Some 1,200 visitors climbed the hill to stare into the hole on Section 22, a remarkable turnout for a region so sparsely populated that its only real town, Glasgow, numbers a mere 3,500. With the aid of town leaders, Rigby had made it his crusade to see that the bones stayed in northeast Montana, as the pièce de résistance of a big new museum to be called the Fort Peck Dam Interpretive Center, scheduled to open in 2005. In October, Rigby participated in a radio talkathon and other campaigns that raised nearly $100,000 for the center.

The local enthusiasm was epitomized by Pat Dunn, who volunteered for days on end to help dig. Vain about the assorted scars that decorated his muscular torso, Dunn had been nicknamed the Human Backhoe for the astounding energy he lavished on the excavation. A ranch hand on his father's spread, which lies in sight of Section 22, Dunn had grown up with the Waltons ("I fought 'em all," he confessed).

Dunn was a genius with the spud bar, a heavy seven-foot-long spike used to pry recalcitrant earth and stones loose. During a rest break, he told me a remarkable family story. "This spud bar belonged to my grandfather, Albert Edward Dunn. He came straight out here from Brown University to homestead. In 1902, he helped Barnum Brown dig that *T. rex* over on Hell Creek, and he used this very bar."

For a while in November, it looked as though a dicey jurisdictional dispute might break out over the ultimate fate of the new *T. rex*. Because Section 22 turned out to be owned by the federal government, the Smithsonian Institution had first claim to the dinosaur. The Museum of the Rockies in Bozeman, as the official repository for Montana, was making its own claim, hoping to preempt the yet-to-be-built Fort Peck Dam Interpretive Center. The White House announced a resolution on November 19: though the fossil would remain the property of the U.S. government, it would stay in Montana, ultimately to be displayed at Fort Peck (if the new interpretive center really gets built), or at the Museum of the Rockies.

COULD IT BE A NEW SPECIES?

MEANWHILE, AS MORE AND MORE PIECES OF THE dinosaur came to light, Rigby's perplexity and delight escalated. The bones had been so jumbled and disarticulated by the ancient flood, it took sophisticated work to distinguish the *T. rex* from the other dinosaurs interred with it. And gradually Rigby began to suspect that there was a smaller *T. rex* intermixed with the giant one.

Moreover, as he studied some of the bones in the lab, Rigby puzzled over certain anomalies. One evening, in the basement of the field station, he showed me these quirks. The "boot" of the pubis was twice the size of that found in other *T. rex*es. The tail vertebrae were also huge. The skull, however, was a normal size. Were there three

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Security guards protect the site from further looting. Test digs revealed that there are more fossils in every direction.

T. rexes here? Rigby had begun to wonder out loud whether his colossal dinosaur was not after all a *T. rex*, but perhaps some new species never before identified.

Whether or not it was a *T. rex*, the giant predator from Section 22 had become a kind of paleontological prize trophy. But what truly boggled Rigby's mind were the implications of four trial pits he had dug last summer, at selected distances from each other.

"Everywhere we dug, we hit bones," Rigby said. "If it turns out really to be continuous, the hill might be wall-to-wall dinosaur. We've got what looks like a Who's Who of the late Cretaceous."

Rigby suspects that, near this lonely hill some 66 million years ago, a large number of animals were suffocated at the same time by some volcanic eruption—not the asteroid impact hypothesized as the cause of worldwide extinction, but a local event. Rigby, in fact, is one of the leading opponents of the asteroid theory. He believes the dinosaurs gradually degenerated and died out, and—though some colleagues dispute his findings—he claims to have unearthed dinosaur fossils from strata more recent than the Cretaceous-Tertiary divide, when (so others argue) the asteroid and the resulting atmospheric catastrophe wiped out much of life on earth.

Yet, because the hill in Montana dates from the very end of the Cretaceous, whatever lies beneath its surface, in what may well be a mass dinosaur graveyard, has the potential to yield huge scientific dividends. A decade ago, Rigby would have faced such a prospect with unalloyed joy. Now, his joy is laced with dismay, even with a germ of dread: for in the new climate of big-time commercial fossil-hunting, the hill in McCone County is an open invitation to vandals from all over the world.

This fact came vividly home to me when, two days after leaving Montana, I traveled to Sotheby's in New York City, to attend the first *T. rex* auction ever held.

In August 1990, Susan Hendrickson, a volunteer fieldworker for a commercial fossil-hunting outfit called the Black Hills Institute of Geological Research in Hill City, South Dakota, had found some pieces of a *Tyrannosaurus rex* coming out of the side of a sandstone bluff in the South Dakota badlands. "Sue," as the dinosaur was named in honor of its discoverer, would turn out to be the largest, most complete and best preserved *T. rex* yet unearthed. It also proved to be a beast with a violent history, for bite marks and broken and healed bones testified to combats with other great animals, and a massive gouge in the skull argued that Sue had been vanquished in a battle to the death, possibly with another *T. rex*.

The Black Hills Institute is one of the most reputable

"She will spend her 70 millionth birthday in the Field Museum of Natural History."

commercial fossil exploration companies, and its president, Peter Larson, had paid the Cheyenne River Sioux Indian, Maurice Williams, on whose land Sue was found, $5,000 for the *T. rex*. In 1992, however, more than 30 FBI and other government agents descended on Larson's lab and confiscated both Sue's bones and other fossils. A possibly overzealous U.S. attorney prosecuted Larson for stealing government property, based on Larson's 20 years of fossil hunting. The attorney tacked on charges that Larson had traveled abroad without declaring traveler's checks in excess of $10,000. Larson was convicted of the latter charges and spent a year and a half in prison.

"THE WORLD'S MOST FAMOUS FOSSIL"

MEANWHILE, A FIVE-YEAR LEGAL BATTLE ENSUED OVER the ownership of Sue. The Black Hills Institute filed a civil suit to regain the *T. rex*. The government argued that since Williams' land was on an Indian reservation, and was thereby held in trust by the government, Larson had no right to enter into a contract with Williams without prior government approval. The courts ultimately ruled that the *T. rex* belonged to Williams. Whence the auction. What one observer called "probably the world's most famous fossil" was up for sale to the highest bidder, with a single Native American rancher to reap the profits.

Sotheby's had estimated that Sue would go for more than $1 million. Many of the bidders' identities were unknown to the audience. The auction lasted nine minutes—nine of the most dramatic minutes I had ever spent indoors. Bids were made by agents in the audience discreetly raising paddles, and over a bank of phones. The action was too fast and too subtle for me to follow, but the throng gasped as the numbers rose to three, four, five and six million dollars.

The bidding slowed; then auctioneer David Redden brought down his gavel, announcing a winning bid of $7.6 million—$8.36 million, with Sotheby's commission. Redden announced that the winning bidder, Richard Gray, would shortly make a statement.

Gray took the podium. It turned out he was a fine arts dealer serving as representative for the winning bidder. With a fine sense of drama, he praised "the world's largest and oldest young lady. She will spend her 70 millionth birthday on the shores of Lake Michigan"—Gray paused—"in the renowned Field Museum of Natural History."

The crowd cheered wildly. Gray went on to explain that most of the Field money had been put up by Disney and McDonald's. For the moment, the story of Sue seemed to have a happy ending. Big business and one of the world's most respected museums had conspired to buy the dinosaur for all of us.

Perhaps the story of the dinosaur in McCone County will have a happy ending, too, once the creature can be freed from the rocks of its 66-million-year slumber, put back together, installed in a Montana museum, and admired and studied in all its enigmatic glory. But it is awfully hard not to see the looting of Section 22, as well as the auction of Sue for millions of dollars, as portending something deeply ominous for the future of paleontology.

In the past few years, dinosaurs have joined pre-Columbian antiquities in the realm of objets d'art, fetching high prices both at legitimate auction houses such as Sotheby's and in an international black market. Just last year, someone stole a set of fossilized dinosaur tracks from a remote site in aboriginal Australia; they have yet to be recovered. In the United States (unlike, say, the Canadian province of Alberta), fossils that are found on private land remain the property of the landowner. If Sue can command more than $8 million at auction, what incentive does a Maurice Williams (or a Fred Walton) have to deliver his dinosaur to a low-budget academic such as Keith Rigby, when he might sell it via the World Wide Web to some wealthy speculator?

In November 1997, a United States district court in Montana ruled in a summary judgment that the land Steve and Pat Walton have been living on belongs not to them but to the United States government. I had sensed a kind of tragedy in the Waltons' doomed bid to save their land and feed their families as I lingered in Montana last September. This came home one afternoon when photographer Ted Wood and I returned to Fred Walton's trailer to take pictures. It was Sunday, and Walton's wife and three children were there.

For me, it was an awkward get-together. Sixteen-year-old Elizabeth ruefully passed on the comment of a friend in Milwaukee, who had phoned to tell her that the national media were portraying the Waltons as "these psycho hicks from hell."

But 9-year-old John, who had dutifully mowed Rigby's lawn through the autumn months, still dwelt in a certain innocence. Proudly he showed me a picture that had run in the Glasgow *Courier*. Earlier in the summer, Rigby had donated bones from a hadrosaur to the local library. There in the photograph stood John, helping to install a leg bone in the new display case.

David Roberts last wrote on the Navajo's exile to Bosque Redondo, New Mexico. Photographer Ted Wood lives in Jackson Hole, Wyoming.

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(Hint: it has four wheels and eyes)

PHOTOGRAPHS BY HARROD BLANK

Smile! (Click) It's the

Clad in a flash-cube costume, art-car aficionado Harrod Blank poses with his latest creation. Inside, he snaps candid reactions to the van, with its historical array of cameras and film containers (center), aided by a video monitor. Right: The *Camera Van* takes Manhattan.

CALIFORNIAN HARROD BLANK HAD A dream. He was the creator of an "art car"—a preposterous-looking Volkswagen Beetle with a beach ball paint job and glued-on plastic fruit bumpers. In his dream, he imagined the fruit displaced and the colorful paint obscured by hundreds of cameras, transforming his Beetle into a motorized insect with hundreds of eyes. As he slept, he saw his VW shutterbug traveling the world, taking pictures of the first impressions of all who came to marvel at it. When he awoke, he thought, "How bizarre," and then turned his dream into a reality. He anticipated a low-budget, six-month project, but it took two years and $20,000.

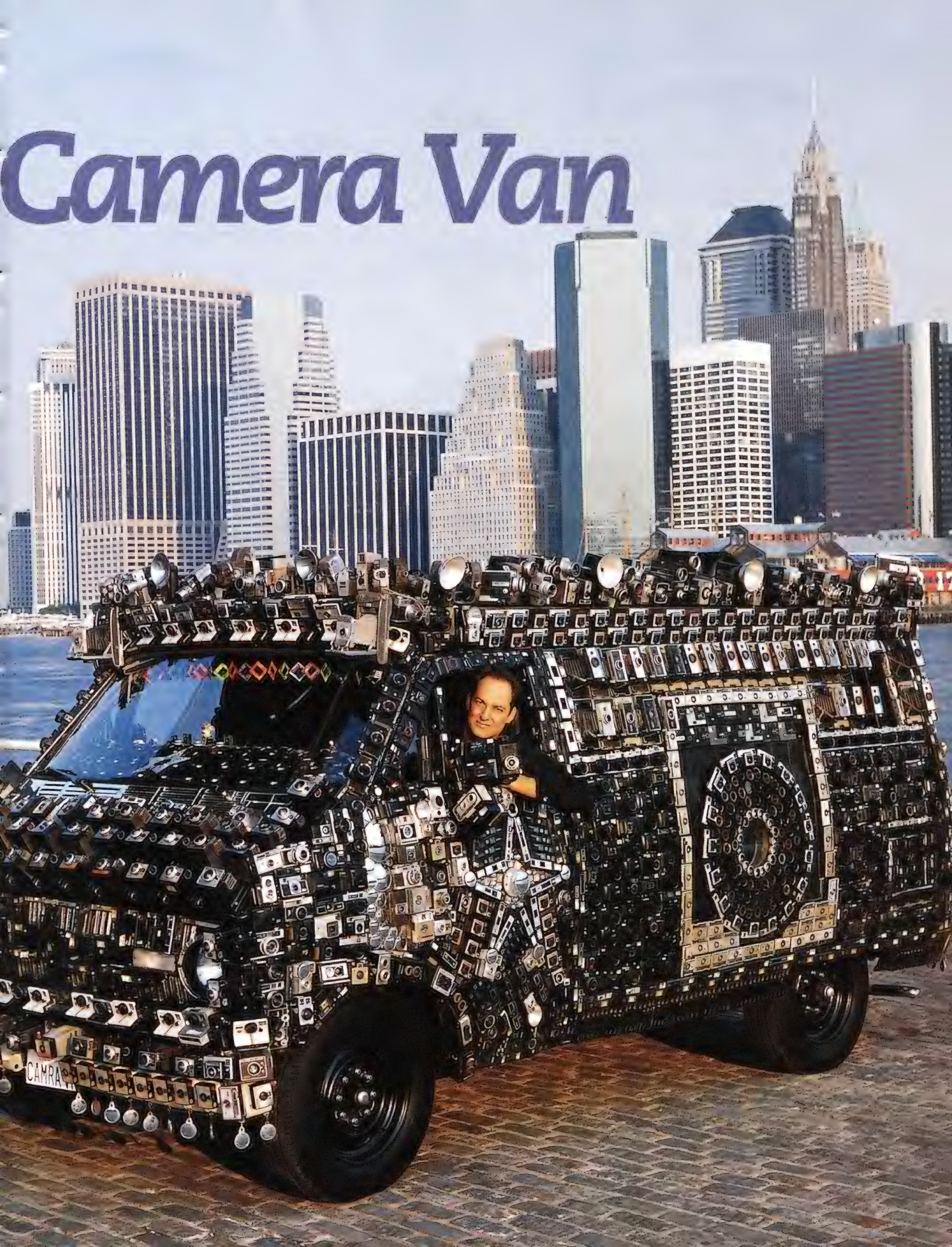
Blank purchased a 1972 one-ton Dodge van for his canvas, and the Santa Cruz Goodwill Industries' Bargain Barn gave him most of his 1,705-camera palette (they couldn't sell them to a throwaway society). He purchased a few at thrift stores and yard sales, and individuals donated their Brownies, Leicas, Polaroids and Instamatics to the rolling museum. He acquired a Mamiya, and several Argus "Bricks" and 1920s Kodak Autographics. Along the roof he mounted 140 Super 8s and Straight 8s and a Bell & Howell 16mm movie camera that once filmed battles in World War II. Silicone caulk fastens the plastic cameras, and rivets secure anything weighing more than a quarter of a pound. Although the flash attachments of 40 cameras are rigged to set off a dazzling light show, the only working cameras are five Canon EOS 630s. A well-concealed video camera just above an EOS feeds into a TV set inside the cab: when Blank sees the facial expression he wants, he pushes a button, snapping the shot. Two years after his 1993 prophetic dream, Blank unveiled the *Camera Van* in New York City.

It takes six hours, three rolls of paper towels and a bottle of Windex to clean the *Camera Van*. Blank travels at dusk to minimize sun damage and seeks shelter at the first hint of rain. He lost one camera to a thief, but notes, "People are too respectful of the novelty to commit vandalism."

Blank pumps his own gas, and musing over his favorite picture, a cigar-pointing citizen at a Mississippi gas station (page 55), he chortles: "The *Camera Van* gets 10 miles to the gallon. In smileage, though, I get 100 smiles per gallon."

—Ruth Ravenel

Camera Van



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Making Room For PRAIRIE DOGS

BY CATHERINE DOLD

THESE COLONIAL RODENTS ARE CUTE—IF YOU'RE NOT A CATTLEMAN OR EVEN A SUBURBAN HOMEOWNER WATCHING YOUR GRASS DISAPPEAR. MILLIONS STILL LIVE ON THE PRAIRIES, YET THE LITTLE RASCALS ARE IN TROUBLE

"THEY FEEL LIKE LITTLE ANGELS CRAWLING UP YOUR arm," says Jarid Manos. He is looking not to the heavenly blue Kansas sky above, however, but to an empty lot below, in a town called Hutchinson. There are probably 80 or more "angels" in this lot, Manos figures. And he wants to find them all.

Sporting a raised-fist Earth First! tattoo on his shoulder, Manos reaches into one of the hundred or so dirt-ringed holes that dot the empty lot. His colleague Paula Martin, dirt smears on her face, uses a hose from a nearby water truck to guide a mixture of water and biodegradable dish soap into the opening. Using her fingers to aerate the water, Martin creates frothy suds that fill the burrow below. The plan is that the suds will irritate the eyes of any inhabitants and force them to crawl to the surface, where Manos is waiting. Minutes later, soap suds begin to pillow out onto the ground and Manos nods his head. He feels something crawling onto his hand. Another angel. He deftly scoops up the critter, pulls it free of its home, and holds it aloft by the back of its neck.

Manos might consider his prey a gift from heaven, but it's a creature that many Westerners would call the devil: a black-tailed prairie dog. A wet, soapy and none-too-happy prairie dog. Manos holds the animal still while Martin dabs at its face with a towel and squirts saline solution in its eyes to clear out the soap. The animal is then placed in a dog carrier half full of hay. Manos checks the hole for stragglers, and he and Martin rise from their mud-caked knees to drag the hose to another prairie dog mound.

As they move across the lot, Manos and Martin are surrounded by 30 or more people: animal-loving volunteers, a troop of seventh-graders and curious neighborhood residents. Also tagging along are newspaper reporters and two television crews complete with carefully coifed reporters who later do stand-ups while gingerly holding wet and wriggling prairie dogs. Prairie dogs have been big news all summer in this central Kansas town, and everyone wants to witness firsthand the fate of these controversial creatures. Some in the crowd try to anticipate which hole will be flushed out next, and rush there to stake out a good viewing spot. Others opt to stick as close as possible to Manos and Martin, at times making it nearly impossible for them to move their equipment. Once they settle in at the next hole, parents lift small children onto shoulders and newsmen hoist heavy television cameras over the crowd. Everyone wants to see.

Manos and Martin are astonished by all this attention. Members of the Denver-based Prairie Ecosystem Conservation Alliance, they spend every weekend trying to save and relocate prairie dogs, and rarely does anyone pay much attention at all. They have come to this particular lot—driving all night from Colorado—to save a bunch of prairie dogs that the Hutchinson town council had decided must make way for a new baseball field. Some council members wanted to simply kill the pesky rodents and be done with it. A few residents, however, didn't agree, and one wrote a letter of protest to the newspaper. "It is unfortunate that the elected council of the city of Hutchinson has no compassion on the matter

of life," wrote Janet Laird, an animal lover who lives near the lot. Laird, looking for alternatives to killing the animals, urged Martin's group to come to Kansas. The city council finally agreed to hold off on the ball field construction and even supplied water for the rescue operation.

Manos and Martin and their newly trained local volunteers, including Laird and her friends, work the field all day Saturday and Sunday, taking few breaks from the 90-degree heat. By Sunday night 76 animals have been loaded into dog carriers and are ready for transport to their new home. Monday morning, a caravan of volunteers escorts the animals out of town, past fields of wheat and sunflowers, to the Quivira National Wild-

Clockwise, from left: Paula Martin squirts soapy water down a burrow in Hutchinson, Kansas, to drive the animals out; Jarid Manos holds a soggy rescuee as volunteer Norma Exposito looks on; dogs are packed for the journey to a new home.

life Refuge in Stafford, Kansas. There, the prairie dogs are placed inside a couple of large, steel water troughs from which the bottoms have been removed and which are topped with chicken wire. Food, water and a few starter holes have all been provided. The hope is that the animals will be safe from predators here until they can dig burrows. Dave Hilley, manager of the refuge, estimates that, if all goes well, they will dig out of this protective enclave in a few hours, by which time "they'll have some ownership of the holes."

Hutchinson's debate over the fate of a prairie dog town is one that is becoming increasingly common in Western states. Ranchers have long despised the animal, believing it eats grass rightly meant for cattle, and that its burrows and entrance mounds tear up the land and pose a hazard to livestock that might stumble and break a leg. They are hard-pressed to see anything angelic about the animal. In ranching circles, "it is verboten to even mention the name 'prairie dog' unless you are swearing at them," quips Jon Sharps, a wildlife consultant who studies them. More recently, contempt for the animals has spread from countryside to cities and suburbs, as housing developments and strip malls take over land that no one but the prairie dogs wanted before. Developers now find they must somehow deal with the animals—burying them alive with bulldozers being one option. Homeowners are finding that, while it's fun to watch the animals down the road as they chatter and fret and throw up their paws in alarm, those next door are not nearly so cute when they are chewing up carefully tended lawns.

Yet even as prairie dogs gain more enemies, they are finding new friends: animal lovers like Martin are taking up their cause, and biologists are warning that prairie dogs are actually good for the environment, even vital to a healthy prairie ecosystem. Some say that these animals are so important, and in such trouble, that just like gray wolves and manatees, they should be protected as endangered species. Of the five species of prairie dogs—black-tailed, white-tailed, Gunnison's, Mexican and Utah—only the latter two are

protected. The others, say wildlife advocates, are declining fast.

In the early 1800s explorers Lewis and Clark reported seeing an "infinite number" of prairie dogs. Infinite might be a bit of an exaggeration, but it probably wasn't too far off. Even a hundred years ago, prairie dog towns occupied an estimated 100 million to 250 million acres, with parcels scattered along the short- and mixed-grass prairies from Canada to Mexico. The total number of animals probably topped 5 billion. One Texas town alone covered 25,000 square miles and held an estimated 400 million animals.

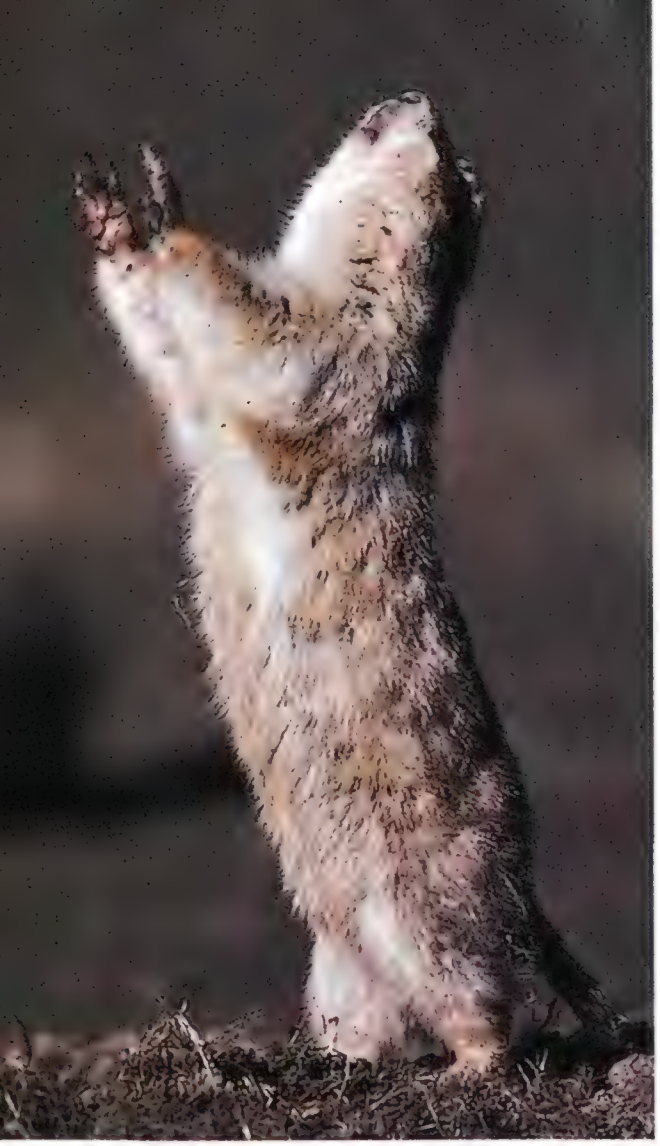
For years prairie dogs happily shared their land with bison, which tramped down vegetation and made it easier for prairie dogs to spot predators. The ranchers who settled the West never did like the prairie dogs, however. They saw these small, cinnamon-colored rodents eating the same grass as their livestock and decided they must go. Their disdain for the critters was greatly bolstered in 1902 when one C. H. Merriam, director of the U.S. Biological Survey, declared that prairie dogs decreased the productivity of rangelands by 50 to 75 percent. "It's not at all clear how he came up with those numbers," says Rich Reading, director of conservation biology at the Denver Zoological Foundation. "They are vastly in error." Fabricated or not, Merriam's numbers gave an "aura of scientific legitimacy" to the ranchers' claims, says Reading, and the campaign to eradicate the prairie dog took off. States, counties, individuals and the federal government poisoned millions of acres of animals with strychnine. By 1960, because of this poisoning, as well as conversions of natural prairie to farmland and suburbs, prairie dogs had been wiped out in at least 98 percent of their habitat.

Eradication programs today are not as extensive as in years past, but they do continue in both urban areas and public lands. Landowners and agencies such as the National Park Service and the Forest Service (which manages national grasslands) now try to control prairie dogs using toxic zinc phosphide baits or aluminum phosphide gas. Some property owners pay $1,000 a day to have the animals sucked into a vacuum truck and hauled away. Most are killed or injured in the process. (So are other creatures who frequent the burrows.) South Dakota, which like many states considers the animal an official pest, in the early '80s poisoned out a 450,000-acre complex—the largest remaining town in the United States. On top of the poisonings, the smaller size of the towns makes the animals more vulnerable to bubonic plague, a disease that overnight turns prairie dog colonies into ghost towns.

Only about one and a half million acres of prairie dog towns now survive in the West, and their existence is precarious, warn biologists. The cumulative impact of all these threats could, they say, lead to the disappearance of the species, and an "ecological train wreck" on the prairie.

"I'm not mad at 'em. I just can't live with 'em," Miles Davies explains

Clockwise, from above: A young prairie dog "kisses" an adult so it can check the adult's scent; a dog gives a "jump-yip" alarm call; in one Colorado town, tracks link holes, which are about six feet apart.



while bouncing across his ranch in a dusty red pickup. "We had a few small towns here a few years ago. I thought they were cute. But I found out you can't keep just a few," he says, driving toward some of the cattle he raises on 3,000 acres just east of Denver. He points to a wheat field on his left. "That whole field was covered with prairie dogs," he says. "A pair of them came in 1981 and I ended up with 500 acres of them in ten years." Davies tried to coexist with the animals, he says, but found it impossible. "They ate all the grass. There was none left for the cattle. You can't afford to have 500 acres that you don't get anything out of." Last year Davies decided he'd had enough and laid out poison bait. Nearly all the prairie dogs died, and he is planning to dispose of the last of the stragglers soon.

Davies is probably more accepting of prairie dogs than many ranchers, given that he did try to live with them. Many of his colleagues just flat out hate them. But they are misguided, say prairie dog researchers. It's true, they do munch on grass, and a Department of Agriculture publication says they remove as much as 90 percent of the available forage. But studies by Dan Uresk, a Forest Service research biologist, and others show a different picture: prairie dogs eat no more than 4 to 7 percent of the grass that would otherwise be eaten by cattle. In other words, if a rancher gets rid of prairie dogs, his cattle will enjoy at most a 7 percent gain in forage. Other studies have shown, Uresk says, that cattle actually prefer to feed on prairie dog towns because the rodents' never-ending grass clipping helps the forage to stay greener and more succulent.

Ranchers also fear prairie dog invasions because of the "broken leg" phenomenon. But that always seems to have happened to someone else. "There has never been a documented case of that happening except in John Wayne movies," says Sharps. "Those are old wives' tales." Sharps tells of posing the broken leg question at a conference in South Dakota. "I had a captive audience of a couple hundred ranchers. I said, 'If anyone knows of a cow or a horse that has broken a leg in a prairie dog town, please raise your hand.' Nothing. Silence. It's a myth. Everyone says, 'Oh, yeah, I've heard that,' but when it comes right down to it, they can't come up with anything."

So why do ranchers continue to despise the prairie dog, in the face of all this modern research? "There is absolutely no rationale to it," sighs Sharps. "They just do it. Their daddies did it, their granddaddies did it, they are going to do it. Their minds are made up."

The hunting community has also made up its mind: prairie dogs make darn good targets. "I'd love to have some on my land," says Marc Minkin, vice president of the Varmint Hunters Association. "I'd like to be able to step out my back door in the morning and take a couple shots before my morning coffee." Prairie dogs are one of the more popular varmints to shoot, for the 45,000 members of his South Dakota-based group, says Minkin. "It's something you can do as a family. You're not wearing camouflage, freezing in a tree stand." The best places to shoot, says Minkin, are the "uneducated towns" that haven't been shot at a lot, where the animals are still naive to the danger posed by hunters. The prairie dog has "no friends in the human or animal world," insists Minkin. "It's really a prairie rat."

A favorite activity among hunters is the competitive prairie dog shoot, with prizes for whoever bags the most animals. Probably the most famous such contest was held in Nucla, Colorado, in the early '90s, attracting entrants from all over the country, as well as protesters and much negative publicity. Nucla had to discontinue the event three years ago because so many of the dogs had succumbed to plague, there just weren't enough left to shoot.

Despite Minkin's assertion, many people do like prairie dogs. Some say it's because they remind us of little humans, living in family groups, kiss-

ing, grooming, and squabbling like siblings. Any intruder, whether a dog, hunter or hiker, sets off a chain reaction of warning calls. Black-tailed prairie dogs display the comical "jump-yip" alarm call, throwing their front paws up in the air and arching their backs while calling out a high-pitched "chirp-chirp-chirp." Others scurry to hide in a burrow, sometimes peeking over the edge. After a few minutes the animals let down their guard and go about their business, but they never roam far from a burrow entrance. These underground warrens, some a hundred feet long, provide warmth in winter and coolness in summer, nursery areas, places to mate and to sleep, listening posts, and, of course, refuge from predators.

Given that prairie dogs spend more than half their lives underground, it is perhaps not surprising that one researcher studied them for seven years before making a remarkable discovery: prairie dogs, cute as they may be, are stone-cold killers. Mother prairie dogs regularly practice infanticide and cannibalism in the privacy of their burrows. And contrary to many other species, they are not killing nonrelatives in hopes of ensuring the survival of those closest to them genetically, but are killing and consuming very close relatives: nieces, nephews and siblings. According to the researcher, John Hoogland at the University of Maryland, the nursing mothers are probably desperate for food.

Odder still, says Hoogland, is that a few weeks after this rampage, when the babies move aboveground, mothers will nurse pups they once tried to kill. Such behavior might seem altruistic or perhaps even apologetic, but the motive may very well be still entirely selfish. Having someone else's babies around provides a bit of a buffer zone from predators. Despite his discovery, Hoogland remains a fan of prairie dogs. If you get them young enough, he says, they make great pets, greeting human companions with a gleeful jump. Indeed, thousands of young prairie dogs are sold each year worldwide for as much as $150 each. They do, however, have a nasty little habit of trying to dig burrows in sofas.

Prof. Con Slobodchikoff of Northern Arizona University is another fan. He is convinced that they have one of the most sophisticated languages of all animals and that a seemingly generic alarm call could actually be saying, "The dangerous man wearing a green shirt and carrying a gun is here," or, "The harmless guy is back, no problem." Slobodchikoff has spent countless hours in a wooden blind recording the chirps of animals in response to events such as a student or a coyote crossing the town. He and his students then analyze the vocalizations, playing the tape into a computer that breaks down each seemingly monotone chirp into a graphic representation of its numerous harmonics. Statistical analysis of those structures reveals that different events elicit very different calls, which apparently are obvious to a prairie dog.

"Each chirp is actually a fairly complicated statement," says Slobodchikoff. He doesn't know yet just how much information can be packed into one chirp, but so far his studies have shown variations in response to a predator's species, size, shape, color, speed of travel and level of threat. What's more, the prairie dogs have good memories, he says. In one experiment, two people walked through a prairie dog town that had experi-

enced a fair amount of hunting; one was a "hunter" and carried a simulated rifle. The prairie dogs, as expected, gave a different call for each person. Weeks later, when the hunter showed up without his rifle, says Slobodchikoff, "they still gave the call for when he had the rifle. The exact same call."

So what if prairie dogs are cute and smart? Do we really need to worry if there are a few less rodents in the world? Yes, say wildlife biologists. They consider prairie dogs keystone species, which actually create a particular type of habitat, and warn that we could lose not just several species, but an entire ecosystem. "The prairie dog is like the earthworm of the prairie," explains Larry Shanks of the U.S. Fish and Wildlife Service. "It creates shorter grasses, tunnels for burrowing owls, a food source for ferruginous hawks. It's a real nucleus of an ecosystem." The prairie dog ecosystem supports at least 170 species, including black-footed ferrets, hawks, eagles, mountain plovers, owls, coyotes, badgers, bobcats and foxes.

"Some of those are 'obligate' species, like the black-footed ferret," says Jon Sharps. "Ninety-one percent of its diet is prairie dogs and 100 percent of its habitat requirements are prairie dog colonies. There are also 'semi-obligate' species like the swift fox; about half of their diet is prairie dogs." The near extinction of the black-footed ferret, in fact, was caused largely by the decline in prairie dogs.

Foes of the prairie dog point to the many pockets of animals found in the West and ask how they can possibly be in trouble when they seem to be everywhere. It's not simply a matter of numbers, respond biologists. Today's populations are too small and too far apart. A prairie dog ecosystem might need to be as large as 20,000 acres to be healthy, but most today are only a few hundred acres at best. Such fragmentation leaves them vulnerable to disease, natural catastrophes and genetic problems.

Wildlife experts cite the prairie dogs' woes as a prime opportunity to put into practice "ecosystem management," a relatively new approach to conservation. Instead of throwing millions of dollars at each species that has the misfortune to become endangered, this theory holds, why not try to preserve and manage an entire ecosystem at once, preferably before anybody gets into serious trouble? A bit of effort to save the prairie dogs now, biologists argue, could result in a big payoff—ecologically and financially—for all the species that depend on them.

The Front Range area of Colorado is prime prairie dog habitat—and prime people habitat. Consequently, the state is losing thousands of acres of open space each year to housing developments, highways and strip malls. Although Paula Martin and her volunteers are saving as many prairie dogs as they can, the animals are being pushed off one chunk of land after another.

Driving around Denver's suburbs with Dave Weber, a state biologist, it's easy to feel sorry for the animals. Weber pulls into a lot behind a new strip mall, expecting to find a farmhouse and acres of prairie dogs. Instead, he discovers that town houses have taken over at least half the habitat. "Last time I was here those houses weren't there," he says, parking next to construction trailers. "I saw ferruginous hawks sitting on the ground right where the houses are now." Not all of the prairie dogs have been rout-

One way or another, prairie dogs support an ecosystem. From far left: A badger prepares to dine on an unlucky individual; ferruginous hawks fight over the spoils; a coyote digs into a burrow; and burrowing owls share a home.

P. 67 (LEFT) LEONARD LEE RUE III/PHOTO RESEARCHERS; PP. 66,67 WENDY SHATTIL/BOB ROZINSKI (3)

Prairie dogs feast on the grass in a field of sneezeweed flowers in Oklahoma's Wichita Mountains National Wildlife Refuge. The animals' true impact on rangelands remains a matter of dispute between biologists and cattle ranchers, among others.

ed just yet. Some still make a living on land east of the new homes. Weber points to two white smudges in a distant tree. "Bald eagles," he notes. Eagles and other raptors migrate here each winter to escape colder climates, expecting to find prairie dogs. "They probably won't be here next winter."

Other Front Range towns, faced with similar development pressures, have moved to protect prairie dogs. The city of Boulder, 30 miles northwest of Denver, led the way in 1987 by setting aside land for prairie dogs, now nearly 5,000 acres. Boulder, in fact, was the first town in Colorado to officially consider prairie dogs in its management plan. Farther north in Fort Collins, the issue arose in the early '90s, when a housing development wiped out 120 acres of animals, says Karen Manci, a city environmental planner. "We started asking, how can we stop this from happening again? The writing was on the wall that we were going to lose them all to development." In 1992, that city's natural areas plan assured that the acreage would be set aside for prairie dogs. Even more important, says Manci, the attitudes of residents changed. "In seven years I've seen this community go from saying, 'What the heck, they're varmints,' to becoming aware of the value of prairie dogs. Before 1990 we had 268 acres of prairie dog colonies. Now we have 1,700."

Conflicts do arise, however. On the western edge of town, where the grasslands rise into the Rocky Mountain foothills, Manci tramps through a three-year-old housing development to a wide strip of designated prairie dog habitat. Between the houses and the animals is a buffer zone and a two-foot-high fence. "Look, there are two prairie dogs on the wrong side of the fence," she says, pointing to animals lurking perilously close to the houses. Last spring, a ruckus erupted over the city's plan to poison some prairie dogs that had migrated onto private property here and elsewhere in the city. "We got bad press as killers," sighs Manci. "And we're the ones who saved 1,700 acres." The city agreed to hold off on the fumigation so Martin and her crew could relocate some of the wanderers. Even so, "not one neighbor has said to get rid of them all," Manci notes with a smile. "They all just say, 'Keep them on *your* side.'"

Not all rescues have happy endings. Prairie dogs were taken out of Hutchinson, Kansas, in three separate batches. In their new homes they were protected from humans, but not their natural enemies. Every last one in the first two batches of 76 and 44 was killed by predators. Some believe that they were placed in an area where the grass was too long for them to see anything approaching them. Others said that they were "city" prairie dogs and did not have the necessary survival skills. The 17 animals in the third batch were placed in an existing prairie dog town and are believed to have survived (none was marked). Undeterred by the losses, Martin is out every weekend, one step ahead of the bulldozers, saving one prairie dog at a time.

Colorado-based Catherine Dold last wrote on how rescue dogs are trained. She is now equally fond of the prairie variety.

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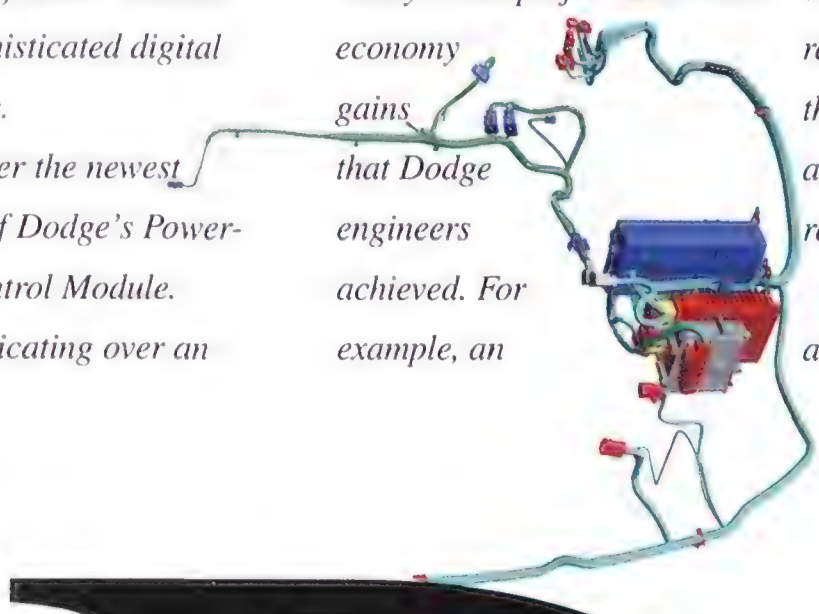

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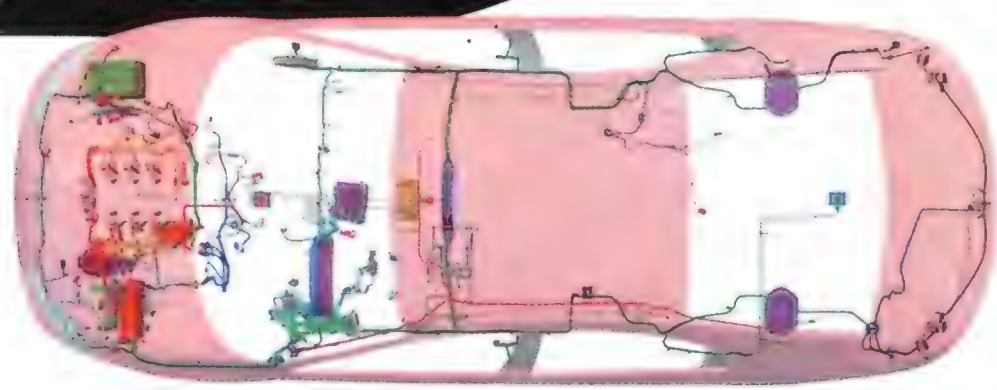

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A Window On a World of Shape & Color

BY KENNETH BAKER

RICHARD DIEBENKORN ALWAYS SIDESTEPPED THE HYPE; NOW, HIS ART IS SAYING IT ALL

In Seated Figure with Hat, 1967, a five-foot-square oil, Diebenkorn treated his wife, Phyllis, as though she were a slice of subject matter inserted midway between the viewer and an abstract painting.

IN 1944 A YOUNG MARINE NAMED RICHARD DIEBENKORN encountered a painting at the Phillips Collection in Washington, D.C. that would inspire and challenge him for the next 50 years—*Studio, Quai St. Michel* (1916) by Henri Matisse.

Diebenkorn, then 22, had drawn or painted for most of his life; as a boy in San Francisco, he had made drawings on the cardboards that came in his father's laundered shirts. By the time he stood in front of the Matisse at the Phillips, he had taken art courses at Stanford and the University of California at Berkeley. But he did not yet know he would become an artist, nor had he dreamed that his own work would one day hang in the Phillips Collection, alongside pictures that he revered by Matisse, Paul Cézanne, Pierre Bonnard and Piet Mondrian. At the time, he would remember many years later, "my father didn't think being an artist was a respectable or worthy goal for a man."

Left: *Ocean Park No. 140*, 1985, is eight feet high. Above: *Marine Jacket*, 1943.

Since his death in 1993, Richard Diebenkorn has been recognized internationally as the only American painter to extend the classic modernism of Matisse. Yet, their connection is not apparent to everyone: Matisse was not an abstract painter, and Diebenkorn's most sustained meditation on Matisse's work took form as a long, grand series of abstractions. That series of large paintings—which is justly ranked by many critics as among the finest 20th-century paintings by an American—is named after Ocean Park, the neighborhood next to Santa Monica where Diebenkorn had a studio for 20 years.

The "Ocean Park" paintings are the radiant core of a survey of Diebenkorn's art that is currently on view at the Modern Art Museum of Fort Worth (through April 12). A collaboration of the Phillips Collection and the Whitney Museum of American Art in New York, where it debuted last October, the exhibition was organized by guest curator Jane Livingston, a longtime friend of the artist, and is sponsored by J.P. Morgan and Philip Morris. After closing at Fort Worth, the show will continue to the Phillips (May 9-August 16) and the San Francisco Museum of Modern Art (October 9-January 19, 1999).

In 1944, Diebenkorn was a marine stationed at Quantico, Virginia, soon to be dismissed from officer's candidate school for insufficient martial ardor. He and his new wife, Phyllis, escaped military life on weekend leave by visiting the museums in Washington, only 30 miles away.

At that time, the Phillips had been open to the public for just over 20 years and was still a family affair—a mansion filled with a very personal collection of modern art. People sat, smoked and chatted about what they saw there, something they were unlikely to do in more formal museums. During the war, visiting servicemen got an especially warm welcome.

Diebenkorn's art would take decades to evolve, yet the qualities that energize his late abstract work are implicit even in the few pieces that survive from the early 1940s. I saw such a work in 1992, on the one occasion when I visited him and Phyllis at their neat, white Victorian house in Healdsburg, about an hour north of San Francisco. A 1943 pencil drawing, it hung above Diebenkorn's favorite chair—his poor health had reduced him to working from this chair.

The drawing depicts the military jacket that Diebenkorn wore while in the Marines. Draped over a coat hanger hooked to a closet door, the jacket echoes the characteristic shambling posture of the artist.

The open door and its frame foreshadow uncannily the geometric play of lines and angles in later abstract pictures such as *Ocean Park No. 32* (1970) and *Ocean Park No. 107* (1978). Like Matisse, Diebenkorn used a doorway or a window as a metaphor for what a painting is. The jacket itself hangs well above eye level, yet we see its epaulets as if from slightly above. Meanwhile, we seem to look straight ahead at the jacket's buttons, and down at its hem. Subtle contradictions like these are everywhere in Diebenkorn's later abstract paintings.

The Diebenkorns' house in Healdsburg was like a museum of his art, with drawings and paintings hung almost from floor to ceiling in places, interspersed with a few things made by others.

I was hopeful, as all his visitors must have been, that I might get a look into his studio, a refurbished barn-like structure that was visible through the window. And he

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seemed willing. But when the question arose he explained, with a wistful glance toward the little building, that it would not be possible. For some months he had been too weak even to cross the gently sloping lawn—perhaps 50 yards' distance—that separated the house and the studio. "This is my studio now," he explained, gesturing from his chair toward a drawing board close at hand that he could hold on his knees. And indeed, the last works in the retrospective were made on that drawing board. They are small, quirky compositional studies in acrylic and gouache on paper that seem to recapitulate and rejigger everything he had done—but that he did not live to transfer to canvas.

Born in 1922 in Portland, Oregon, Diebenkorn grew up in San Francisco, where his father was a successful businessman. His boyhood penchant for drawing developed slowly into a serious study of painting; in his family, only his grandmother took an interest in the visual arts. While at Stanford, ostensibly to satisfy his parents' expectation that he cultivate a respectable profession, Diebenkorn discovered the work of Edward Hopper, whose images of bleak, shadow-gouged facades would soon influence his own paintings of architecture and land flattened and mitered by hot California sunlight. While in the Marines, he took courses at Berkeley, where he first reckoned with the subtle pictorial paradoxes of Paul Cézanne, another giant whose art would arrest him at the Phillips Collection.

Soon after his discharge in 1945, Diebenkorn enrolled at the California School of Fine Arts in San Francisco (now known as the San Francisco Art Institute). His work there was so outstanding that he immediately won a fellowship. It enabled him to spend time in New York and in the upstate artists' haven of Woodstock. After his return to San Francisco, he was recruited to teach, and he developed intense, though not necessarily harmonious or lasting, collegial relationships with other faculty, including Clyfford Still, Hassel Smith, David Park and the visiting Mark Rothko.

Abstract Expressionism was in the air, a bravura style of improvisational painting defined by the so-called New York School, whose leading light was Willem de Kooning. Like de Kooning, Diebenkorn was a naturally gifted draftsman, and his paintings met with immediate local recognition.

By the end of 1949, Diebenkorn was tiring of teaching at the CSFA. He decided to take advantage of the G.I. Bill and pursue a master's degree in art at the University of New Mexico in Albuquerque. He had driven through New Mexico once as a teenager and had always wanted to go back.

Today, Phyllis Diebenkorn confirms that every time they moved, Richard's work changed in response to new surroundings. As a graduate student at UNM, Diebenkorn was given a Quonset hut for his studio and pretty much

Diebenkorn's response to the desert of New Mexico—as well as to a major show on Arshile Gorky—is evident in *Albuquerque No. 3*, from 1951.

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In the exhibition catalogue, Jane Livingston calls *Ingleside*, 1963, "an eternally fresh painting," a dramatic tour de force of light and color.

left on his own to paint. Well away from the Northern California terrain and the factional squabbles at the CSFA, he found a more lyrical way of working. "Temperamentally, perhaps, I had always been a landscape painter, but I was fighting the landscape," Diebenkorn reflected years later. "In Albuquerque I relaxed and began to think of natural forms in relation to my own feelings." A work like *Albuquerque No. 3*, from 1951, echoes the rosy, powdery colors of New Mexico's soil.

But Diebenkorn was also soaking up other influences. Early in 1951, he had flown from Albuquerque to San Francisco to see a museum show devoted to New York painter Arshile Gorky, who had committed suicide three years before. *Albuquerque No. 3* echoes Gorky's wiry, surrealist style of drawing and his paintings' teasing hints of symbolism. And at least as important to Diebenkorn as the Gorky show itself was the experience of seeing the desert from the air. "The aerial view showed me a rich variety of ways of treating a flat plane," he later told writer Dan Hofstadter. "Of course, the earth's skin itself had 'presence'—I mean, it was all like a flat design—and everything was usually in the form of an irregular grid. . . . I think the many paths, or pathlike bands, in my paintings may have something to do with this experience, especially in that wherever there was agriculture going on you could see process—ghosts of former tilled fields, patches of land being eroded."

Intimations of an elevated viewpoint occur throughout the "Berkeley" series of juicy, landscape-inspired abstractions Diebenkorn did after his return to the Bay Area in 1953. Once he made a decisive turn back to imagery, in landscapes such as *Cityscape* and *Ingleside*, both from 1963, elevated viewpoints become more pronounced.

That decisive turn came in 1955, when, following the lead of David Park, Diebenkorn abruptly turned away from abstraction, painting landscapes and interiors peopled by human figures. Elmer Bischoff, midway between Park and Diebenkorn in age, was the third leader of the tendency that soon became known as Bay Area Figuration. Park, never comfortable painting without a subject, was in deliberate rebellion against the heroic stance of abstract painting as it was then practiced in New York. Diebenkorn credited Park with helping instill in him the artistic conscience not to be content with his own facility at improvising abstractions. "There was nothing hard to come up against," Diebenkorn said later of his early abstract work, but "suddenly the figure painting furnished a lot of that."

Coffee, painted in 1959, is a prime example of so-called Bay Area Figuration. A midsized picture, less than five feet square, it has a surface ruffled with brushstrokes, like a windswept sea. The subject is a human figure, a woman sipping from a cup, seated in a chair at an open window. Yet the harder we look, the less certain we become of the picture's content. If we focus on the figure, the window behind her with its grassy view flattens out, as if it were an abstract painting hanging on the wall. But if we shift attention to the window, the figure collapses into a compositional stage prop. Reminding us again of Hopper's influence on Diebenkorn, *Coffee* evokes no inner life on the woman's part; the only interior here is the room itself.

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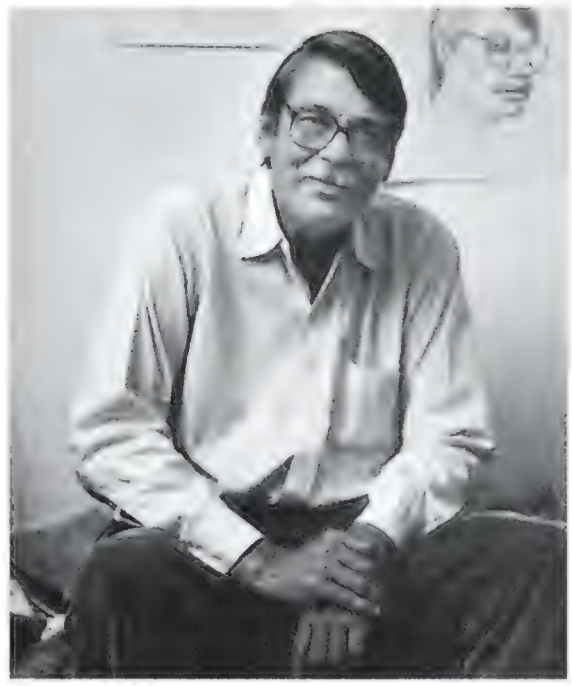
Recollections of a Visit to Leningrad, 1965, is one of Diebenkorn's painted homages to Matisse, whose works had a profound, lifelong influence on the artist.

Coffee, 1959, is a key painting from the years Diebenkorn worked closely in the San Francisco Bay area with artists David Park and Elmer Bischoff.



When this picture was taken in 1986, Diebenkorn was at the top of his form.

Phyllis Diebenkorn was probably the model for *Coffee*. Often, says the Diebenkorns' daughter, Gretchen Grant, her father would catch her mother raising a coffee cup to her mouth, and he'd say, "Could you hold that?" and her mother would oblige for hours.

Another painting that Phyllis posed for was *Seated Figure with Hat*, one of Diebenkorn's last figurative paintings. It dates from 1967, the year after the family moved to Southern California; Diebenkorn had accepted a teaching position at UCLA. Phyllis remembers how it got started. "I was outside in the backyard, sitting in a chair, and he made a drawing of me," she recalls. "He would make a drawing and then make another or several others from it and then make a painting based on that." The background we see in *Seated Figure with Hat*, she says, is nothing like the setting in which the drawing was made, except perhaps for the intensity of the light.

In this painting, the female figure is a thin wedge of subject matter between us and an enveloping plane of color that might be an unfinished abstract painting. She seems mapped into the picture, a psychological presence being reabsorbed into an abstract pictorial structure. It's as if she is an internal spectator, a symbol of the artist's own critical conscience—Phyllis Diebenkorn, after all, often was the first to respond to her husband's work.

By the time he finished *Seated Figure with Hat*, Diebenkorn had already begun the stunning series of large abstract works that would be titled after his new neighborhood, Ocean Park. Memories of Matisse's work had haunted him throughout his career, and none so deeply as *Studio, Quai St. Michel*. An interior view with a French window that overlooks Paris, it depicts a small room in which a nude model, on a couch with a flowered cover, poses for the artist. We see sketchy pictures hanging on the wall, and propped on a chair, a drawing in progress of the female model.

The most liberating effect of *Studio, Quai St. Michel* on Diebenkorn took many years to bear fruit. It is the way Matisse let the picture's abstract structure shine through the image, like bones through skin. The inconsistent finish of *Studio, Quai St. Michel*—the sense that drawing has shaken loose from color, that revisions need not be smoothed away—gave Diebenkorn permission to relax the descriptiveness that between 1955 and 1967 he had felt was necessary to make pictures cohere.

Gretchen Grant remembers the shock she and her husband felt at seeing the "Ocean Park" paintings for the first time in Diebenkorn's studio. "He just put them up and didn't say anything because he wanted to know our response. We were just speechless at first. . . . I could see their germination, though. The windows"—the studio windows and the view through them—"were very much what he was grappling with at some level." There is nothing descriptive about the "Ocean Park" paintings, yet we can imagine how old Santa Monica's geometry of white and pastel stucco buildings punctuated by windows and sloping rooflines might underlie the pictures' architecture of lines and erasures.

John Elderfield, who organized a Diebenkorn drawing retrospective for New York's Museum of Modern Art (MOMA), recalls that Diebenkorn "was always talking about 'fixing' things," meaning his own work. Diebenkorn's daughter agrees. "There was one painting he did; every time he saw it he'd shake his head and say, 'There's something . . . missing,'" says Grant. "This went on for 15 years. Finally, he took some paint and just put one tiny block of color on it and said, 'There it is. It's finished now.' After 15 years!"

Diebenkorn was fairly secretive when he worked. Except when he made prints and needed a technician's assistance, or when he shared a live model with other artists, he was not inclined to let even close friends watch him. "Once when we were in his studio and he was sort of drifting toward working," Elderfield remembers, "he picked up a certain tool and I asked him what he was using. And he said—only half jokingly—'I don't think we've known each other long enough for me to answer that question.'"

Another quality that her father had, says Grant, was a profound respect for the written word. She remembers an occasion when he was being given an award at a university graduation ceremony that had dragged on for a while. "My father went up to the podium to accept his award and just said, 'Thank you very much.' All the students in the auditorium exploded into cheers, they were so happy his speech was so short."

As our century ends, the future of abstract art itself seems in doubt. Even people with a taste for abstract painting wonder whether it may be a period style whose time has passed. Surprisingly, it is the Pop artists who now seem to promise a future of sorts for painting. The tensions between personal authorship and found source material in the work of Andy Warhol, Robert Rauschen-

Horizon—Ocean View, 1959: "attempt what is not certain," Diebenkorn wrote in his "Notes . . . on beginning a painting."

berg or Roy Lichtenstein seem more attuned with today's dilemmas of identity and orientation than the esthetic balancing acts that absorbed Diebenkorn.

Even Elderfield says that "a love of painting and drawing is actually an impediment to looking at a lot of recent art." Yet it was he who organized for MOMA the 1992 Matisse retrospective, one of the biggest draws in the museum's history. If the people who marveled at Matisse in 1992 recognize Diebenkorn as his heir, then it will not matter how esoteric or private Diebenkorn believed his artistic obsessions to be. He will have found his audience.

Kenneth Baker, who wrote on artist Andy Goldsworthy in February 1997, is the art critic for the San Francisco Chronicle.

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The Long Good-Bye

IN WHICH IT IS ARGUED THAT A LOOK AT THE HISTORY OF DIVORCE MAY MAKE YOU FEEL BETTER ABOUT OUR OWN SCANDALOUS WAYS

BY BARBARA HOLLAND

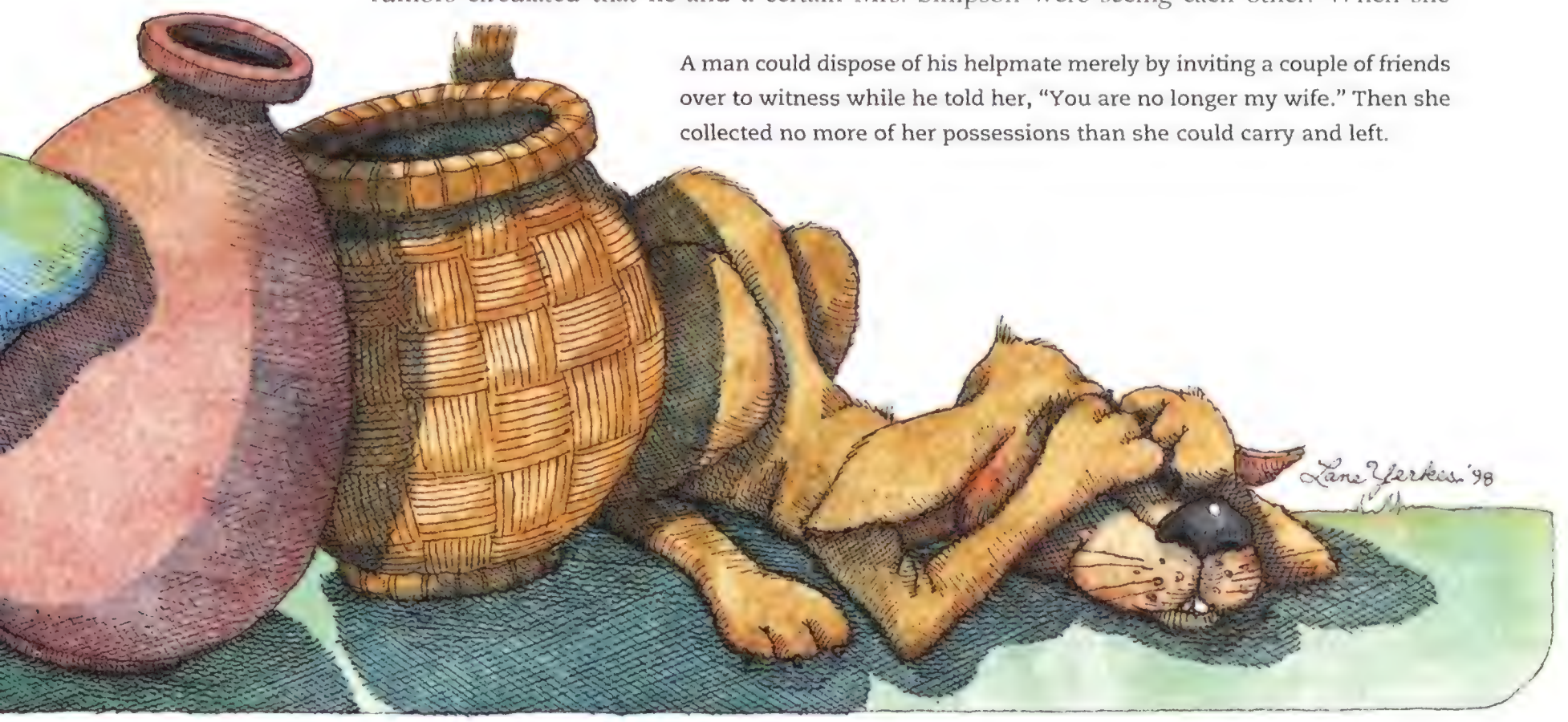
ILLUSTRATIONS BY LANE YERKES

IN JULY OF 1996, IN LONDON, JUDGE GERALD ANGEL CONSIDERED THE COURTROOM full of reporters, and then listened while the court clerk read out the names of 30 applicants for divorce, including "His Royal Highness the Prince of Wales versus Her Royal Highness the Princess of Wales." He didn't even blink. He had previously disconnected Prince Charles' sister Anne, brother Andrew, and longtime mistress Camilla Parker-Bowles; royals were nothing new to His Honor.

The process took only three minutes and set the couple back $125. The grounds offered were separation and the "irretrievable" breakdown of the marriage. Though both parties had confessed on television to other loves, adultery—once the backbone of British divorce law—wasn't mentioned.

The public took it in stride. Nobody suggested that respectable people would stop inviting the ex-couple to parties, or that when Charles was king, he wouldn't be allowed in the Royal Enclosure at Ascot, once off-limits to the divorced. Nobody suggested that, like his great-uncle Edward 60 years earlier, he pack up his shame and leave the country forever.

In the spring of 1936, Great-Uncle Edward had only recently become Edward VIII when rumors circulated that he and a certain Mrs. Simpson were seeing each other. When she



A man could dispose of his helpmate merely by inviting a couple of friends over to witness while he told her, "You are no longer my wife." Then she collected no more of her possessions than she could carry and left.

divorced Mr. Simpson, the citizenry was alarmed. Urchins in the street chorused, "Hark, the herald angels sing—Mrs. Simpson's pinched our king!" The prime minister called on him and explained that it simply would not do to marry what was then called a "divorcee." The public confidently supposed he'd see his duty to his country and hand this American strumpet her hat. Instead he went on the radio and said, while the world sniffled sentimentally, that he couldn't be king "without the help and support of the woman I love." So Wallis Simpson bagged husband number three and, as the Duke and Duchess of Windsor, they withered away together far from the eye of Edward's disappointed ex-subjects and royal relations.

His niece, Queen Elizabeth II, shares the family respectability. Yet today the British first family, whose main function is to set a good example, is an ongoing feast for supermarket tabloids and gossipy Websites.

Conservative moralists believe that the U.S. divorce rate, holding steady at around 50 percent, means the end of the world as we know it—or knew it. They think that back in the golden days, before the late 20th century, people were more virtuous, chaste and dutiful, less self-indulgent, or at least more stoical than we are today. Some states have even instituted optional marriage contracts that forswear divorce except for things like abandonment, abuse or adultery. They hope to revive a past when people got married and stayed there, smilin' through, taking the rough with the smooth, till death them did part.

They hope to revive a past when people got married and stayed there, till death them did part.

Maybe. Maybe not. Poke around in the past and it turns out that divorce in one form or another is roughly the same age as marriage. In 1700 B.C. in famously shameless Babylon, under the Code of Hammurabi a woman could get a divorce if her husband "degraded" her, and she got to keep her dowry, too, along with her personal property and the kids, and he had to pay child support. In most times and places, though, divorce was strictly a man's option.

Before Moses came along to straighten out the chosen people, a man could dispose of his helpmate merely by inviting a couple of friends over to witness while he told her, "You are no longer my wife." Then she collected no more of her possessions than she could carry and left. (Whence, they say, the custom of women wearing jewelry: valuable, portable, ready to go at short notice.) Her ex was now free to whoop it up with other women, but when he woke up with a sink full of dirty wineglasses he often remarried her. This must have been common, because the Book of Deuteronomy dealt with it specifically. Chapter 24 says that if a husband finds "some uncleanness in her," he must give his wife a written bill of divorcement before throwing her out. Both could marry again as often as they pleased, but a man now *couldn't* remarry any of his former wives, because they were "defiled" and that was "abomination."

As manly monotheism spread over the world, mainstream societies came to believe that while a man needed a variety of women, formally or informally, for personal or dynastic reasons, for a woman one man per lifetime was quite sufficient. Besides, most of the time the wife was her husband's property and could no more divorce him than his cow could, or his favorite chair.

Fringe societies were more flexible. In some a woman could even inherit and control her own property, land and livestock, giving her some clout and the prospect of supporting herself afterward, always a key element when contemplating divorce. Before Islam, a Bedouin woman could have more than one husband at a time; if she tired of one she simply turned her tent around with the doorway facing away from him. Among some Pueblo Indians a dissatisfied wife set her man's moccasins out on the doorstep, meaning "Begone!"

In highly organized ancient Rome, marriage was a family affair. An ambitious man might marry and divorce half a dozen times, forging ever more useful family ties. Purely political considerations might force him to put away a wife he loved and take on a shrew. More familiar reasons also applied; Cicero, for example, divorced the mother of his children to marry his rich teenage ward.

There were two forms of Roman marriage. Since a woman had to belong to some man, she was either married with *manu*—full power over her was transferred from father to husband—or without *manu*, which meant that she still belonged to daddy, kept her right to inherit from him and could be repossessed by him and thus divorced. By the time of Augustus, the glory days of empire, a woman could even secure a divorce under marriage with *manu* if her husband was a convicted criminal or a prisoner of war, or had walked out on her.

In theory her husband could always divorce her. But it was wise to have a reason—committing adultery, getting drunk, brewing poisons, making copies of the household keys—and to discuss the divorce in family council. (He could sell the children, too, if he needed money, though in the fourth century Constantine made it a crime for a father to kill them, at least without cause.)

Societies came to feel that while a man needed a variety of women, for a woman one man was quite sufficient.

When the empire crumbled, the laws and customs of most of Europe crumbled with it, and got stirred in with those brought by the Germanic tribes, or "barbarians," who were suddenly everywhere. The barbarians believed it was none of the bride's business whom she married. Her male relatives took care of that, checking the prospect's bank balance first: instead of her family providing a dowry, the groom paid them a bride-price. Bride-price and dowry always seesawed according to the shortage or surplus of women. Human nature being frail, where the family has to pay to get rid of her, a baby girl is usually unwelcome and sometimes doesn't survive. Where she's a salable commodity, she eats better. In a bride-price world, a man who coughs up cash or cows for his wife is less eager to divorce her and start saving for another.

Although men who could afford it had several wives or concubines, the barbarians were strict about female adultery. According to Tacitus, the husband "cuts off her hair, strips her naked, and in the presence of her kinsmen turns her out of his house and flogs her all through the village." So dishonored, she could never return. Of course, her husband also had the right under the law to kill her and her lover as well. Or he could simply demand compensation.

A man's adultery had never been of much interest—at least not to men—and if he wanted he could legitimize the children thereof; William the Conqueror's mother wasn't his father's wife and he inherited Normandy, anyway. But until quite recently any wife suspected of making extramarital whoopee was in serious trouble, since nobody wanted to leave the farm, or the kingdom, to another man's child. No doubt death seemed a sensible precaution, lest she already be carrying the alien seed. Husbands sometimes found suspicion handy. Servants could be bribed or tortured to testify to a wife's adultery. Not that testimony was always necessary; in the early Middle Ages a man might simply accuse and kill her in a single gesture.

Christianity moved into the leadership vacuum left by the Fall of Rome. Suddenly monogamy was supposed to apply to men as well as women. "And I say unto you, Whosoever shall put away his wife, except *it be* for fornication, and shall marry another, committeth adultery; and whoso marrieth her which is put away doth commit adultery." Furthermore, "What therefore God hath joined together, let not man put asunder."

It was a radical new concept, but marriage and divorce remained family, not religious, matters for years. As the barbarian customs overpowered the Roman, women lost the right to divorce that they'd enjoyed under Augustus. In the sixth and seventh centuries upper-class men could have all the women they could afford (Dagobert I, King of the Franks, married three in a single ceremony), and if that didn't satisfy them, they could divorce them all with a wave of the hand. The handwriting was on the wall, though, and by the eighth century one wife at a time was more usual, and often a priest was called in to bless the union. Church councils made divorce harder. At the same time, inexplicably, they made annulment easier. They

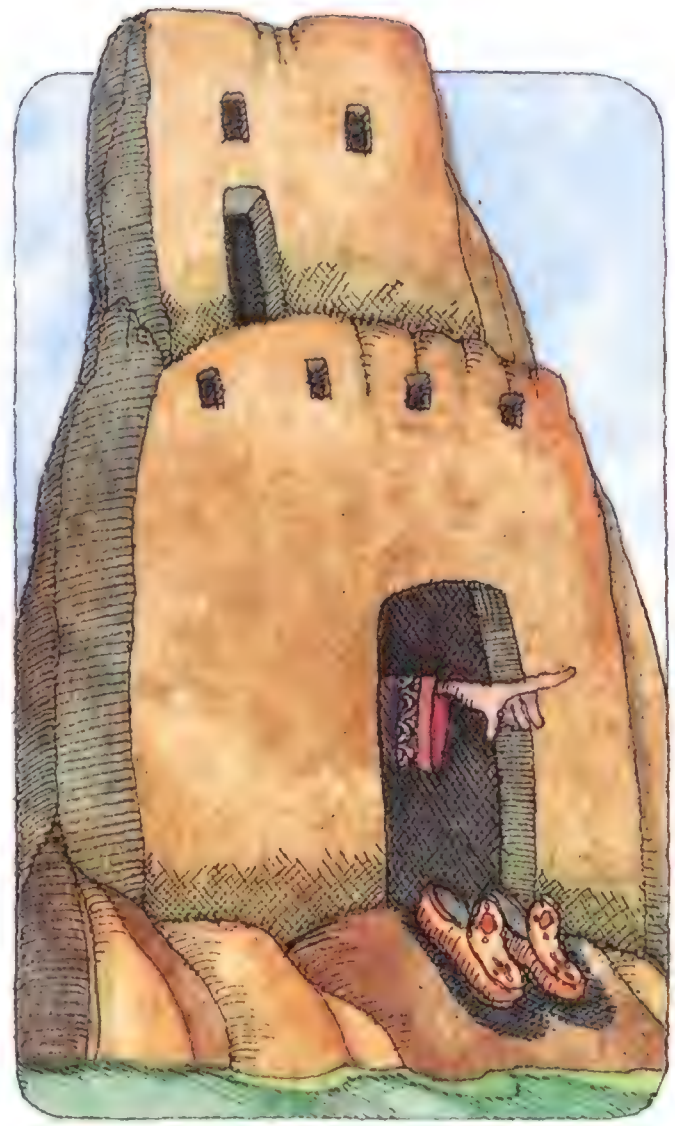
broadened the reach of illegal incest from cousins out to any descendants of one's 128 great-great-great-great-great-grandfathers.

This wasn't much use to the common man, who barely knew who his great-grandfathers were, but it was a boon to the aristocracy, who could afford creative genealogists. The rule stood until 1215 and created plenty of muddle down the road, as when Louis VII and Eleanor of Aquitaine, married 15 years and sick of each other, discovered to their horror and amazement a common ancestor previously obscured in the mists of antiquity. An archbishop friend annulled them, and Eleanor married Henry II of England and took ownership of part of Aquitaine across the Channel with her, helping to bring about the Hundred Years War.

Where the marriage was legal, though, the Church was flexing its muscle, and the ninth century introduced the first important male on record who had trouble unloading his wife. Charlemagne's great-grandson Lothair II, king of Lotharingia (now Lorraine), was married to Theutberga, who was childless. Lothair wanted to marry his old girlfriend Waldrada, because they'd had kids together. He filed for divorce, claiming that before their marriage Theutberga had been unchaste with her brother Hicbert. The church was skeptical, especially since Lothair had given her the *Morgengabe*, or morning-after gift, meaning she'd been a virgin on her wedding night.

Lothair was no gentleman. He alleged that her brother's doubly unnatural attentions had left her a virgin, and worse, she had resorted to witchcraft to conceive a child by him anyway, then changed her mind and aborted it.

Theutberga insisted on a trial by ordeal, and hired the customary stand-in to jump into boiling water for her. He hopped out unboiled, thus proving her innocence. Disappointed, Lothair clapped her into the dungeon to make her confess. She did, to the king's personal chaplain—or so the chaplain said. The church granted Lothair an annulment and he moved in with Waldrada. Then, heeding the advice of Hincmar, the archbishop of Reims, the church changed its mind.



Among some Pueblo Indians a dissatisfied wife set her man's moccasins out on the doorstep, meaning "Begone!"

During the process Hincmar hammered out a clarification that would stand for a thousand years. Marriage, he declared, was both a religious and a civil contract, and divorce required both religious and civil consent. The archbishop believed in permanent, faithful marriages, because he felt this provided a lifestyle so inherently boring it gave a man leisure to contemplate his soul's salvation. New wives and concubines were far too distracting.

Lothair got another divorce with the help of another set of bishops and married Waldrada anyway, but Pope Nicholas I canceled the divorce, warning Lothair that even if he killed Theutberga he still couldn't marry Waldrada—because they'd committed adultery.

The whole mess lasted eight years. One by one the church shot down the king's perfectly acceptable grounds for divorce: barrenness, incest, unnatural sex, adultery, witchcraft, abortion, and his previous commitment to Waldrada. In a last-ditch stand he said Theutberga wanted to enter a convent, always a clincher divorce-wise. Perhaps to his surprise, she did. But so did Waldrada. Possibly the same convent. She must have been fed up. Lothair died without legal heirs and his uncles moved in and divided up the country.

Hincmar held the case up as warning to all men: marriage is forever.

Across the Channel, Englishmen continued to enjoy their age-old freedoms. Even women had a few. A woman who left her husband could take half the family goods and chattels. If she was caught with a lover, at his own expense the lover had to find her husband a new wife.

This lax state of affairs was doomed. By the 11th century, unfaithful wives got their noses and ears cut off and all their possessions confiscated. That was when they still had possessions. Presently church and state decided that everything a woman owned belonged to her husband and

sons and she couldn't inherit from them or anyone else, either, since even dresses and earrings could descend only in the male line. By the 14th century women in England had all but vanished, legally speaking. Their deaths were no longer recorded and their names were even erased from genealogies.

Under the new morality, the God-fearing, law-abiding middle classes were stuck with each other. The rich and the poor had more leeway. For the poor, there were prostitutes and various informal, semipermanent arrangements, and back before Social Security numbers started dogging us, a husband could simply disappear and marry again elsewhere.

In 18th-century England, a man who couldn't afford to vanish could dispose of his wife by selling her to another man. This folk custom was popular from medieval times until well into the 19th century; Thomas Hardy used it in *The Mayor of Casterbridge*. A 1772 source explains that the husband "puts a halter about her neck and thereby leads her to the next market place, and there puts her up to auction to be sold to the best bidder, as if she were a brood mare or a milch-cow." Since she is now someone else's, she obviously isn't his, so he goes home and marries again. (This was probably less appalling than it sounds. Historians figure it was often by prearrangement, with buyer, seller and merchandise all in agreement, providing a swift and amicable closure.)

Women had fewer alternatives, although a man's impotence was always fair grounds for annulment. To prove impotence in certain jurisdictions, "seven honest women" were appointed to labor diligently over the poor embarrassed fellow, noting his reaction. No reaction, no marriage, with both the parties free to roll the dice again.

Among the rich, a man could simply move in with his mistress. If his wife had already produced an heir and he had an extra castle or a dungeon in the basement, he could lock her up. Or he could try for an annulment, but that was getting tougher.

By the 11th century, unfaithful wives got their noses and ears cut off and all their possessions confiscated.

Henry VIII tried to annul his marriage to Catherine of Aragon, who'd provided only one measly girl-child, on the grounds that she'd briefly been married to his late brother, but the pope had pressing political cause to refuse him. Vexed, Henry broke with Rome, set up the Church of England, and briskly divorced himself. After that, divorce was by act of Parliament only, and cost a fortune.

Across the Atlantic, however, marital rules were left to the civil code of each colony. In 1667 Connecticut passed our first divorce law, offering it in cases of adultery, fraudulent contract, three years' neglectful desertion, or seven years' total disappearance. Afterward the innocent party might remarry. But up until the American Revolution, divorce was legal only in New England, considered a shockingly immoral place because most divorces, then as now, were filed by women. The conservative South disapproved of divorces entirely, though a gentleman might desert several wives in succession, or pack an unsatisfactory wife off to Europe and see that she stayed there.

Matters loosened a bit after the Revolution. Revolutions tend to shake up customs, if only briefly. For a short time after the French Revolution women enjoyed a giddy period of civil freedoms; a 1792 law provided for divorce by mutual consent. But by 1804 the Code Napoléon had once again returned to man godlike powers over his wife. He could divorce her and keep the kids, the house, the money and the furniture. If she was unfaithful she got two years in prison; if he was, it was just his lifestyle.

America continued to work things out state by state. Foreign visitors dropped in and were shocked or impressed. In the 1830s Harriet Martineau wrote, "In Massachusetts divorces are obtainable with peculiar ease." She thought this actually cut down on them and made marriages happier, since people no longer felt trapped. In 1849 one Mr. Brown claimed, "There are more divorces in one year in the state of Ohio than there are in ten in the United Kingdom."

Though to respectable ears this sounded like Sodom and

Gomorrah, in most of the United States before 1850 a married woman was legally in the same boat as slaves, lunatics, idiots and small children. Her husband owned all she possessed or ever would possess and any money she might earn, which wasn't much; she couldn't sign a binding contract or write a will. Beyond the East Coast, tradition weighed more lightly. In the Indiana Territory, women could divorce for bigamy, impotence and adultery. By the time Indiana became a state in 1816, additional grounds had been added, and by 1838 a wife might shuck a husband just because he'd been drunk for two years. Indiana became the Reno of the 19th century, to the horror of conservatives and the relief of women whose husbands never came home from the gold rush.

England, meanwhile, was still in the 14th century and proud of it. Sir William Blackstone, the fountain of jurisprudence, had put it in a nutshell: "Husband and wife are one, and that one is the husband."

Why the lovely, literary, well-connected Caroline Sheridan married the brutal, greedy, lazy Hon. George Norton in the first place remains a mystery. Shortly after the ceremony he took to throwing heavy objects at her, kicking her, and demanding that she write more and more books and give him the money. In 1835 he beat her so hard she miscarried their fourth child. Then he sent the other children away to his cousin's and set private detectives on her, hoping to get rich the following year by suing her friend Lord Melbourne, then prime minister, for "criminal conversation" with his wife. The jury simply laughed at his case, but Norton threw her out of the house, anyway, and refused to let her see the kids.

Caroline picked up her only legal weapon. She wrote passionate pamphlets on English law for women, and later a letter to Queen Victoria begging for changes in the law. She wanted nothing radical, just to give mothers the right to visit their children, at least until they were 7 years old, and abandoned wives some control over their earnings.

Victoria, besotted with her Albert, was devoted to the status quo of family life, and nothing really radical resulted, though Caroline Norton's writings did help produce the Infant-Custody bill of 1839 and a later law protecting married women's property. Between 1670 and 1857 in England, 325 divorces were granted, 321 of them to men. But after 1857, thanks to Caroline Norton's persistent pen, a woman whose husband had abandoned her got to keep any future money she could earn.

To prove impotence, "seven honest women" were appointed to labor diligently over the poor embarrassed fellow.

British social custom demanded that one party be innocent and want a divorce and the other guilty but, mysteriously, not want a divorce. If both parties were sleeping with someone else, both were guilty so they had to stay married forever. If both wanted a divorce, that was collusion, so they had to stay married forever. A royal proctor was assigned to snoop around checking on such matters. It was not until 1923 that English law permitted a wife to divorce her husband for a single infidelity, even if he hardly beat her at all.

In the United States, whether you could get a divorce and when you could remarry still depended on where you lived, or pretended to live. In 1931, in a shrewd business move, Nevada changed its rules. Still offering seven easy grounds for absolute divorce, it shortened its residency requirements to only six weeks (SMITHSONIAN, June 1996). "Mental cruelty" and "incompatibility" entered the language, and, for the first time, being no longer in love became grounds for divorce. The notion that, ideally, married couples should be fond of each other had been cropping up off and on for centuries; even the church

We may be living in an era of marital fidelity unseen since the dawn of time.

recommended "marital affection." Romantic love had been fueled by the ballads of the troubadours and the novels popular in the late 18th and 19th centuries, and Hollywood helped it along in the 20th. Love, long considered a frivolous toy unconnected to the serious business of wedlock, got entangled in the legal bedsheets.

Expectations of wedded bliss soared to impossible heights, and when the glow wore off, as it does, people felt cheated. When a third party inspired a fresh glow, divorce and remarriage were considered less shabby than continuing to meet in motels. State after state relaxed the rules. After the rebellions of the 1960s all personal constraints seemed tyrannical. No-fault divorces replaced the old adversarial rules, even in England. The Roman Catholic Church continues to hold out against divorce, offering only annulment, meaning that for some reason the marriage was never a marriage. America leads the world in annulments; in 1994, Americans won 54,463 out of the 72,744 granted by the Catholic Church worldwide.

Not long ago the woman on alimony was the equivalent of the "welfare queen" in the popular mind, as in *Divorce American Style*, a 1967 Van Johnson, Jason Robards and Jean Simmons film about a man trying to free himself from penury by marrying off his ex. If this was ever true, its days are over. A 1981 California study showed that after a divorce, a man's standard of living shot up by 42 percent, while a woman's plunged by 73 percent.

Middle-class divorced women may be living on canned beans, but for the ex-wives of the rich the old bride-price is reborn as a postdated check, breezily called a "prenup." Ivana Trump, ex-wife of entrepreneur Donald, ended up with $14 million and a mansion. His next, Marla, didn't fare as well, but got a cool million, plus child support and alimony. And just last December, in a high-stakes divorce case that many viewed as a landmark test of women's rights, a judge awarded the wife of top General Electric executive Gary Wendt half of their cash, stocks and other hard assets, plus a part of his stock options and future pension benefits.

Back in London, in the good old 17th century, Samuel Pepys, and in the good old 18th, James Boswell, two respectable married men, fond enough of their wives, spent much of their free time kissing, groping and seducing hundreds of women—actresses, countesses, chambermaids. Both wives knew. Both men considered it just their "nature." Few men kept as detailed accounts as Pepys and Boswell but that doesn't mean they were unique, or even peculiar.

Today's Americans might honestly envy them all those spare hours. Pepys and Boswell could scarcely go out for lunch without grabbing the waitress; nowadays who has time even for lunch, let alone the waitress? Can Mom or Dad, rushing from work to pick up the kids at day-care and on to Cub Scouts, stop for a romantic assignation? Contrary to popular perception, we may be living in an era of marital fidelity unseen since the dawn of time.

Perhaps the divorce rate doesn't mean what it seems to mean. Was it really so character-building to spend one's whole life with a brute or a shrew? The Trumps aside, is it really more shallow and cynical to divorce and remarry than to keep a string of concubines, or to close your eyes when your husband carries on with housemaids? Perhaps the divorce rate measures a sentimental hopefulness, a wistful pursuit of legalized happy-ever-after that somehow, against all odds, we continue to believe in. Unrealistic, maybe, but rather sweet. Besides, despite divorce being possible for under a hundred dollars and swiftly available in many locales, half of all our married folk stay together, for richer, for poorer, till death them do part.

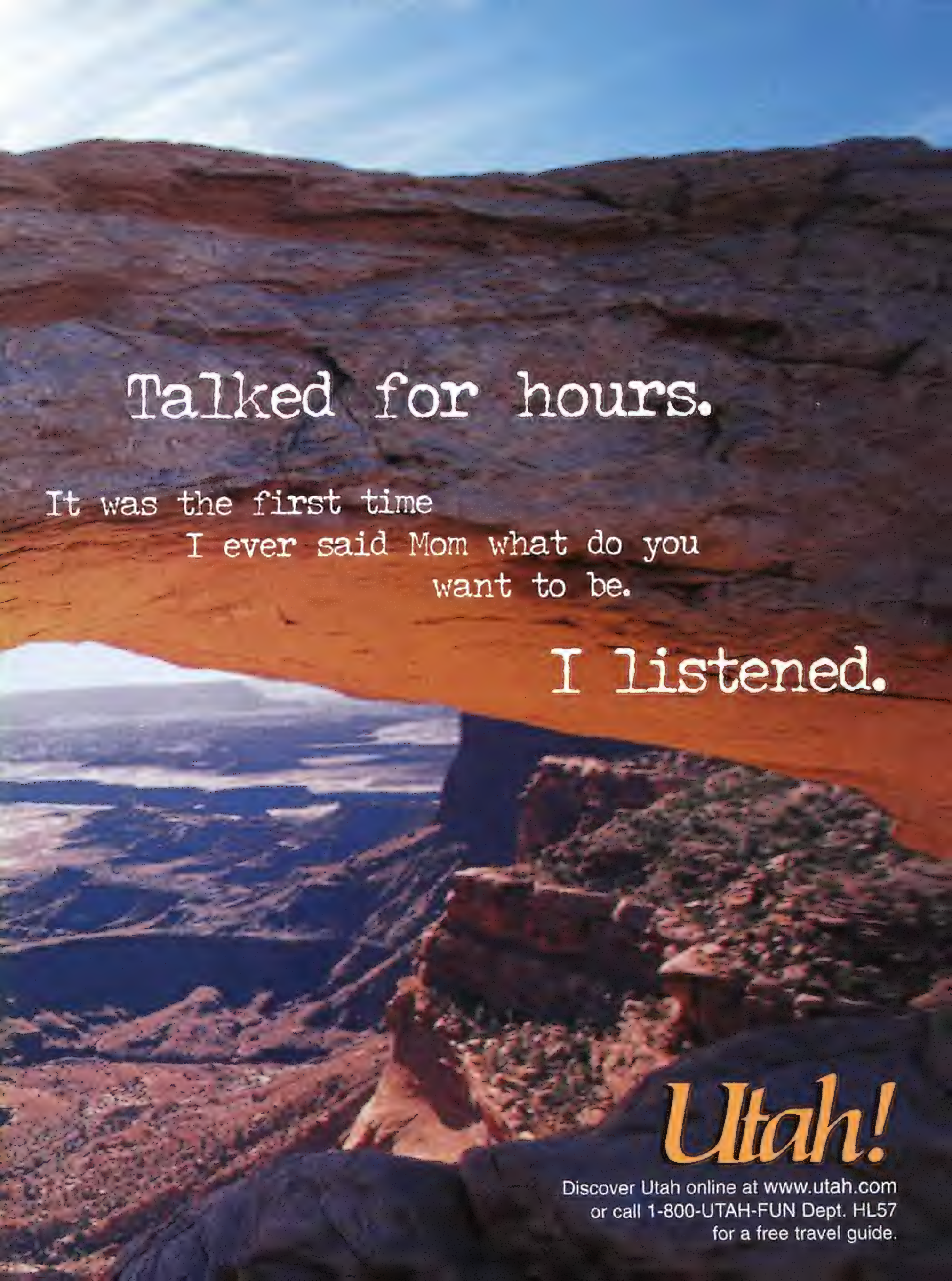
Perhaps things have never been better.

Barbara Holland, a frequent contributor, is the author of a new book, Bingo Night at the Fire Hall *(Harcourt Brace).*

I really didn't have time for this.

But I came anyway.

We watched the sunrise.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It was the first time
I ever said Mom what do you
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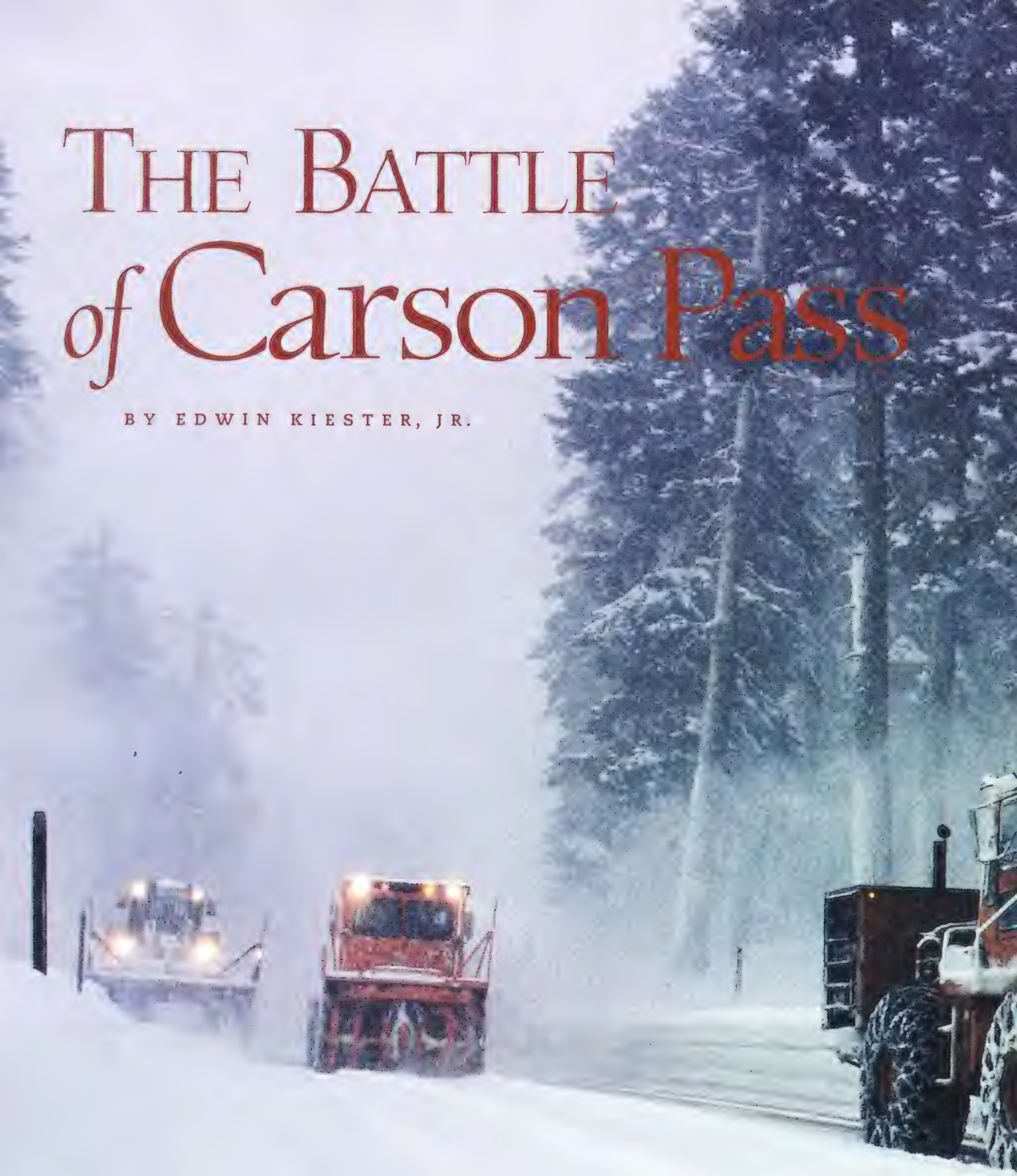
The Battle of Carson Pass

BY EDWIN KIESTER, JR.



PHOTOGRAPHS BY TOM LIPPERT

WHEN WINTER COMES, AND AVALANCHES THREATEN TO HURTLE DOWN THE SLOPES, A 26-MEMBER CREW WORKS AROUND THE CLOCK TO KEEP THIS STRETCH OF CALIFORNIA HIGHWAY OPEN

AT FIRST, THE STORM FORECAST on December 31 didn't seem like much. "Probably just turn the road white," sniffed Joel Allen dismissively. After 16 years fighting snow, three as winter supervisor at Carson Pass, where California Route 88 knifes between 10,000-foot Sierra Nevada peaks, Allen, 38, considered any snowfall of less than three feet hardly worth mentioning. Why, it had once snowed 42 inches in six hours at Carson Pass, and only a year earlier, nine feet of snow lay on the ground when a

Heavy equipment removes the snow after a controlled avalanche buried the road.

record ten-inch rainfall triggered the great floods of 1997. A storm that might drop a few inches—even six inches—was a mere dusting.

Still, New Year's Day was coming up. The holiday would fill the road with celebrating, merrymaking crowds, plus hordes of skiers. Even a mini-dose of ugly weather could mean snarled traffic, accidents and casualties. As a fifth-generation mountain man whose grandfather and great-grandfather had herded Hereford shorthorns in the high meadows, Allen knew about the potential of mountain climate. He alerted the 26-person crew at Caples Lake Maintenance Station to stand by for holiday duty. There would be no days off until the storm let up.

On New Year's afternoon, with the first few snowflakes lazily drifting down and skiers starting homeward, Allen dispatched two trucks to sand the highway as a precaution. "Sand is cheap," he said. "Lives aren't." At 5:30, with most skiers gone and more snow falling, he designated his stretch of Route 88 "R-1": only vehicles equipped with snow tires or chains could proceed. An hour later, the road was "showing white," and he upped the designation to R-2, restricting the road to chain-equipped cars or four-wheel-drive vehicles with snow tires. In the light snow, the last straggle of skiers grumbled as they put on their chains.

The steep slopes that loom over Route 88 at Carson Pass and Carson Spur are prone to avalanches that can instantly bury a two-story-high truck.

"Meager," Allen had said on Wednesday of the anticipated snow. But at 4 A.M. Friday, January 2, it was anything but meager. Big, wet flakes began to pour down in great dollops. Dave Frame, the lanky, quick-witted night supervisor, looked out the windows of the Caples Lake dispatch office and could scarcely see across the equipment yard. The National Weather Service issued a snow advisory to motorists. Doppler radar showed dark-green Rorschach-like blotches of precipitation advancing on Carson Pass. By 5 A.M., the seemingly insignificant "road whitener" had developed into a full-fledged winter storm. Once again, Allen and the Caples Lake crew confronted the difficult challenge of keeping open a major mountain highway in the face of the worst punches Mother Nature could throw.

At 8,574 feet, Carson Pass is neither the highest route through the Sierra Nevada rampart nor the busiest. Four- and six-lane Interstate 80, over the 7,227-foot-high Donner Pass, carries 40,000 vehicles a day, compared with Car-

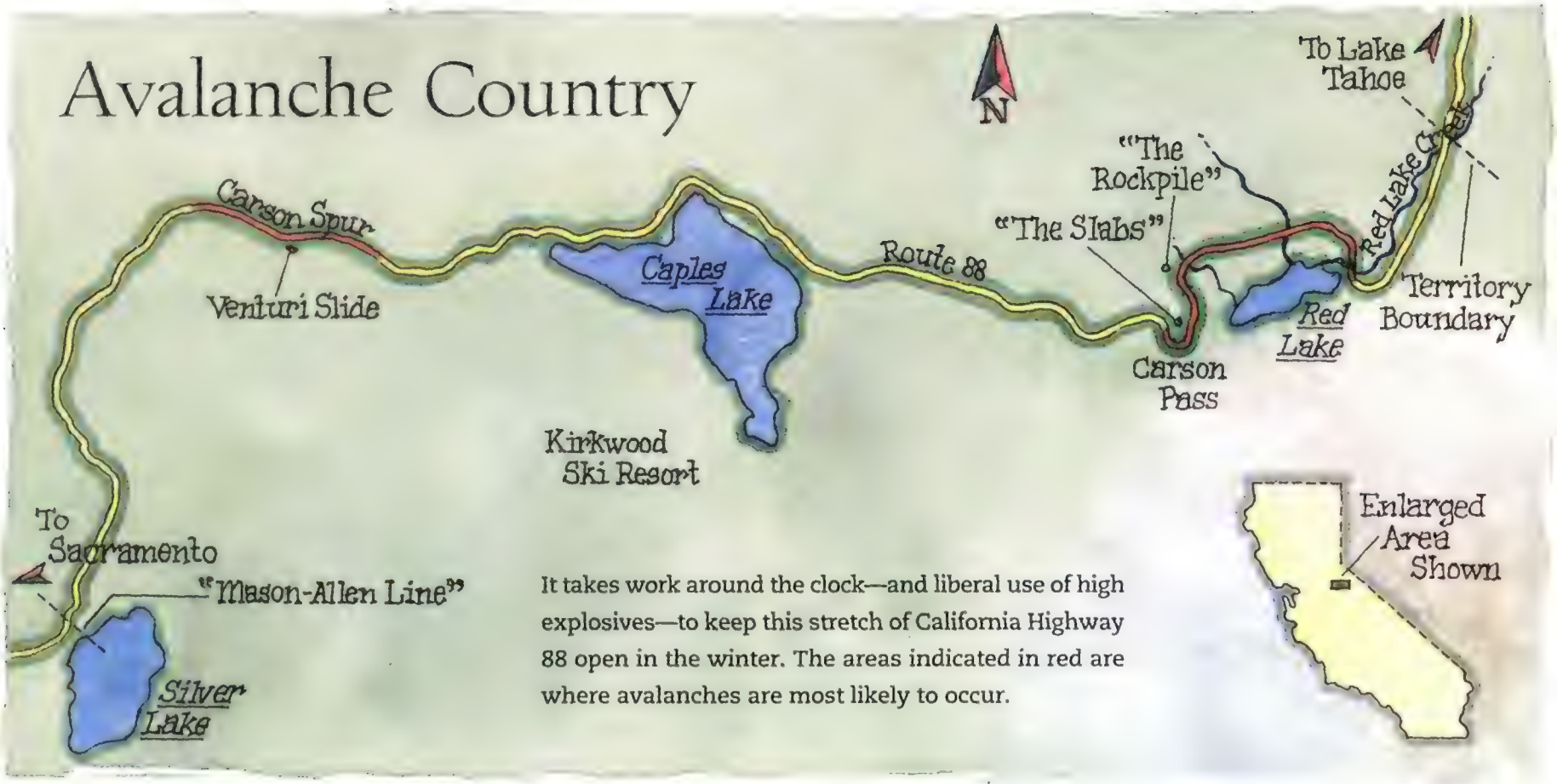
Clayton Jolley of Manteca, California, prepares for the worst at the Red Lake Creek chain-control station.

son's 5,000. Tioga Pass, leading into the Yosemite National Park high country, Sonora Pass and Ebbetts Pass all are higher. Yosemite high country, however, closes in winter; Sonora and Ebbetts feed only rugged, sparsely populated mountain areas. With the first serious snowfall, these passes shut down tight, not to reopen until the thaw of May or June. Route 88, by contrast, is an economic lifeline for the eastern Sierra. Kirkwood ski area, one of the state's most popular, attracts 7,000-8,000 skiers and 2,500-3,000 cars a weekend day. Resorts and businesses south of Lake Tahoe—not to mention Nevada gambling casinos—depend on a "black pavement" Route 88. "For people like us," says Jeff Walters, the Kirkwood resort's director of mountain operations, "a closed road can be a downright disaster."

Keeping a California highway open in the teeth of wind-driven Pacific storms is neither simple nor cheap (and El Niño's quirky behavior this season has not made it any simpler). The California Department of Transportation (Caltrans) spends $29.7 million per year on winter highway maintenance. District 10, which includes Caples Lake, gets a substantial share.

Route 88 costs more because of its lofty altitude and the consequent severity of its weather. Thirty-three miles of Route 88 climb above 7,000 feet, at least five of them above 8,000. Surrounding peaks soar above 10,000 feet and are snowcapped all year. The pass catches 500-600 inches of snow a winter. Wind gusts over the mountaintops have been clocked at 150 miles per hour. Temperatures in the teens are considered balmy. When I announced my plans to visit, Allen's first words were, "Bring warm clothes."

Most treacherous of all, between Red Lake Creek and Silver Lake (the 14-mile stretch of road commonly called Carson Pass) there are two natural avalanche zones, as



It takes work around the clock—and liberal use of high explosives—to keep this stretch of California Highway 88 open in the winter. The areas indicated in red are where avalanches are most likely to occur.

motorists are reminded by attention-getting red warning signs at each entry point. One zone, beginning at the road's steep-sided summit—the true "Carson Pass"—is about two miles long. Its twin to the west, on the other side of the Caples Lake Maintenance Station, is the mile-long stretch of road called Carson Spur.

A century and a half ago, the pioneers learned the hard way that even a careless misstep could send a cascade of white death tumbling down the near-vertical sides. Much of Caltrans' resources for winter highway maintenance are now thrown into efforts to thwart the slides. Nonetheless, says Al Schindler, in charge of avalanche control, "the unexpected natural slide is what we always fear and have to guard against."

Despite Allen's admonition, on January 2 warm clothes seemed scarcely necessary. The early storm had come in "high, wet," in Allen's words, with temperatures hovering near freezing. The three-mile-long, 8 percent upgrade from the Red Lake Creek chain-control station to the top of Carson Pass was slicked with ice. Jason Dehoff, youngest man in the crew, had been assigned to Red Lake Creek to warn motorists of an R-2 chain requirement, and state-licensed "chain monkeys" had already arrived to assist motorists. But even chained cars were slithering and slowly sliding into each other. The road was clogged with crosswise vehicles and frustrated, cursing drivers. Plow operator Chris Barnes, a burly New Zealander who had been working six years in the California mountains, was attempting to clear the eastbound lane at Carson Pass. He had to stop repeatedly to untangle fender benders. Several times, Allen recalled later, "we had to halt traffic completely to sort out the mess."

Allen had arrived at the dispatch office around 7 A.M. and immediately announced "storm shifts"—12-hour crew shifts from 8 to 8. With the storm showing no early signs of abating, the swing and graveyard shifts were combined into a single force, and the daylight crew would extend its hours to 8 P.M. Cook Lionel Blankenship was alerted to have hot food ready at all times. A World War II veteran with a magnificent walrus mustache, he began brewing up one of his popular soups.

"When in doubt, send it out," Allen says. He now mobilized his full force of equipment: two monster Snow-blasts, whose rotary plows could chew up and spit 2,500 tons of snow an hour off the highway, two giant loader-blowers to cut back tall snowbanks, three graders, two plows and two plow-and-sand trucks. He sent graders eastward through the Pass to Red Lake Creek and westward through Carson Spur to the "Mason-Allen Line," the boundary between his territory and "Wally's World," the 45-mile stretch supervised by Wally Mason of the Peddler Hill Maintenance Station. Graders' blades, Allen explained, exert downward pressure on the roadway, as plows do not, and could chisel off obstreperous ice. Blowers followed to hurl the ice and slush off the road. Although ten inches of snow had fallen since 4 A.M., road clearance was obviously keeping ahead of the storm, and Allen and Schindler could turn their attention to avalanche control.

Avalanche research has advanced rapidly since the Swiss first realized that something as innocuous as a falling branch could shake an unstable snowpack and set off a giant slide that would bury an entire village. Experts now know that slopes steeper than 30 degrees are most prone to slide. Light, feathery snow with a low water content is more apt to slide in a series of small avalanches, whereas wet, heavy snow accumulates, then may come down in a great rush. By digging pits deep into the winter snowpack to expose the accumulated ice and snow, they can identify weak layers, which contain more air and are thus less compact than more stable layers. Measuring the thickness

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of the vulnerable layers tells the potential size of the avalanche and the downhill distance it might travel.

Since the 1950s, avalanche control has relied on a simple practice pioneered by Montgomery Atwater of the U.S. Forest Service: set off a series of small slides to prevent snow from building up into a major, disastrous slide. Atwater's technique included using a rifle, 75mm or larger, to propel shells onto slide-prone higher slopes, and hand-placed explosive charges to start slides in more accessible areas (SMITHSONIAN, December 1980).

"Unless we do something about it, it's going to wind up in somebody's lap," says Al Schindler.

The avalanche hazard through Carson Pass and Carson Spur can be summed up in a few figures. Many slopes along the road rise 36 to 57 degrees; "the Slabs" and "the Rockpile" slide paths are almost perpendicular. Typically, the snow's moisture content averages 10-15 percent—creating what skiers disdainfully call "Sierra cement"—unlike the dry, fluffy powder of Utah and Colorado. On the Pass, 7 steep slide paths threaten to send snow hurtling onto the road, and another 15 menace Carson Spur. "When we get nine inches of fresh snow on a two-foot snowpack," Al Schindler says, "unless we do something about it, it's going to wind up in somebody's lap."

Schindler's avalanche fighters combine high-tech and traditional methods of avalanche control. All 22 slide paths are commanded by French-built Gaz-Ex "exploders"—each a 16- to 19-foot pipe, 18 to 36 inches in diameter and curved like an inverted J. The J's short leg is trained downward onto the snow (above, right). Propane and oxygen are stored separately in mountainside shelters near the exploders. On a computerized signal from the Caples Lake command post, the explosive mixture is piped into the barrel and is ignited by a spark. The resulting blast erupts in a roar that echoes throughout the mountains and a huge shock wave that shakes loose the snow. Strictly among themselves, the ribald avalanche crew members call the explosions "elephant farts."

The Gaz-Ex was developed for use in the Alps; according to Schindler, it works very well against the feathery Alpine snow, less well against the wet, sticky stuff of the Sierra. So the crews then resort to hand-placed explosive charges. Because the rocky, spiky 10,000-foot peaks overlooking Carson Pass can be reached only by helicopter in winter, hand-charging concentrates on Carson Spur, which because of prevailing winds and westward orientation catches more snow and is more slide-prone.

The third step is artillery fire. Safety-conscious California abandoned the 75mm recoilless rifle when its dwindling—and aging—ammunition supply became risky and unreliable. The two big guns at Caples Lake have been replaced by two LoCATs, or Low-Cost Artillery Trainers, originally developed by the British for training artillerymen, and now manufactured for use in avalanche control. One 15-foot, bright-yellow LoCAT on the shore of Red Lake hurls projectiles a mile or more across the highway to the snowy higher reaches above the Pass, firing 25-30 rounds in preset directions; the other zeroes in on the Spur. After a series of mechanical glitches, the LoCATs

Al Schindler (far left) prepares to set off hand charges. Dwarfed by the jet roofs (left)—they keep blowing snow from forming cornices—he throws the explosives to trigger slides. The Gaz-Ex "exploder," below the outcrop, works best on light snow. Below: Tom Lupton adjusts a LoCAT artillery piece, used for long-range jobs.

had been helicoptered into position just a few days before the New Year's storm.

Only the first two methods were needed on the afternoon of January 2. Around noon Randy Gomes, a youthful, athletic heavy-equipment operator, returned in a loader-blower to report that the "indicator chutes"—small slide paths presenting no danger in themselves but indicating the instability of the snowpack—were "sluffing." "Looks to me like it's ready to come down," Gomes told Schindler. The avalanche chief had previously weighed a snow sample, and calculated a moisture content of 15 percent; the Caples Lake measuring gauge showed a foot of new snow atop nearly three feet of packed, wind-scoured snow from earlier storms. Allen and Schindler drove through the ski area parking lots and found them filled to capacity. They would face a heavy traffic volume at 4 P.M. Accordingly, they closed the Spur at 2 P.M., fired the Gaz-Ex and then followed up with hand charges. Loaders and graders cleared away snow that reached the road. An hour and 40 minutes later, skiers were safely streaming home in both directions. Allen directed the night crews to restore the road to "black pavement" by morning; by 10 A.M. the next day, all restrictions on vehicles had been lifted.

Just west of Donner Pass in the wee hours of January 3, after the first storm had subsided, Stan Richins reviewed a bank of computers in the Kingvale Maintenance Station. Richins is District 3 maintenance superintendent for Caltrans, and his main, herculean task is to keep Donner open for heavy trailer-truck traffic and streams of cars bound for Lake Tahoe playgrounds. One of his other responsibilities, however, is to collate weather information from the National Weather Service and other computerized services, and feed the results to storm fighters up and down the state. On January 3, the forecasts did not completely agree, so, Richins says, "I did the tiebreaker." At 4:58 A.M. he faxed one of them—a Winter Storm Warning for the Greater Lake Tahoe area, including Route 88: "Today, mostly cloudy. Snow developing during the afternoon. Southwest winds 20-40 mph with ridge winds over 60 mph. Tonight . . . snow . . . heavy at times. Strong gusty southwest winds 30-40 mph with ridge winds over 80 mph causing areas of blowing and drifting snow. Sunday . . . snow . . . decreasing to snow showers in the afternoon. Colder." "Colder" meant a day's high of 15 degrees at the 8,000-foot level of Carson Pass.

At Caples Lake, crews were taking a breather, readying themselves and the equipment for winter's next whammy. Some night shift workers had gone skiing, and others were watching the professional football play-off. Allen was nervously watching the sky. What did "during the afternoon" mean? A 3 P.M. snowfall as skiers headed home could tangle the highway in all directions. Requiring thousands of cars to suddenly put on chains would be a nightmare. If the "afternoon" snow arrived two hours later, at 5 P.M., most skiers would be gone.

Over steaming bowls of Blankenship's beef soup, the men swapped stories of previous storms and close calls

A plow driven by Jason Dehoff provides a scale for the volume of snow dumped on the road beneath the Venturi Slide on Carson Spur.

from avalanches. "I've been hit so many times I've lost count," Schindler said. Only last year Wayne Simpson, operating a loader-blower called "the Duck" because of its waddling motion, had been almost completely buried by a natural slide hurtling down the Spur onto the closed road. Only the passenger-side window of the 12-foot-high vehicle remained uncovered. Unfazed, Simpson radioed his position to Caples Lake, then poked a camera out of the cab and photographed his plight. After an hour and 40 minutes, Ed Cova came to plow him out. Simpson tossed Cova the camera. "Hey, Ed!" he yelled. "Take my picture!"

Simpson is typical of the Caples Lake crew. Although Allen, Schindler and a few others are full-time Caltrans employees, most are "permanent intermittent," or "PI," seasonal workers who return each winter, lured less by the $12-$14 an hour (plus frequent overtime) than a love of the outdoors and an avid sense of adventure. "I'm paid to be where other people pay to be," Tom Lupton gloats. The average crew member has been working "in the snow" for nine years. In summer many drive logging trucks. The talkative, amiable Simpson does construction work in the gold rush town of Jackson. On off-duty days, when the sky is clear, most return to their families, often a 50- to 75-mile commute each way. But when a storm threatens, they live in bunkhouse rooms for days or even weeks. Simpson recalls the first year he worked at Caples Lake. "We were scheduled to quit at 4:30, and I called my wife and said I'd be home by 6," he says. "I got there 22 days later."

When 5 P.M. arrived and the snow had not materialized, a more relaxed Allen gave a thumbs-up sign. Others were growing restive. They cast sidelong glances out the windows for a telltale flake. Blankenship served a staggering dinner of inch-thick slabs of meat loaf followed by chocolate meringue pie. The men dawdled over it to watch the 7 P.M. weather forecast. Doppler radar tracked the storm moving toward Carson Pass but also indicated that it might move to the north. When the night shift took over at 8 P.M. a shard of moon was winking through the clouds. Somewhat disappointedly, the men drifted off to bed. Many later confessed to looking out during the night to see if the storm had arrived. At 3 A.M., Richins' bulletin looked like a false alarm.

Neither the night shift nor those who peeked out the windows after 4 A.M. were disappointed, however. A blizzard howled in, whipped by 50-mph winds. This time Dave Frame not only could not see across the yard; he could scarcely discern trucks parked outside his window.

By 6 A.M., seven inches of snow had come down on the highway. It fell in tiny flakes, in sheets of light, cottony stuff. "Skiers would kill for a few turns in fresh powder like this," Frame said. Plows had started working in tandem in both directions; tiny slides were already occurring on the steep slopes of the Spur. Tom Lupton weighed a

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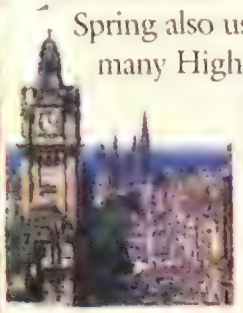

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snow sample. The moisture content was an unusually low 5 percent: it could be made to slide easily.

At the Peddler Hill station, in near whiteout conditions, Wally Mason had already closed at least five miles of his section of Route 88. Now at 6:35, Lupton and Frame closed the Spur, too, citing avalanche danger, and 40 minutes later, with the wind-whipped snow reducing visibility to a few feet, they closed the Red Lake section. Steve Girton, the six-foot-four, 320-pound dispatcher, had come on duty at 5 A.M. At 7:15, he faxed a message to state highway patrol units, Caltrans stations, ski resorts and others: "Temporary Road Closure Notice! Highway 88 is closed from Martin Meadows to Red Lake Creek for avalanche control."

The scene was being repeated up and down the Sierra. The heavy snow had made seeing and driving impossible. At Kingvale, Stan Richins closed Interstate 80 from Applegate to the Nevada border, more than 70 miles. U.S. 50 was closed for about 10 miles.

At either end of the closed stretch of Route 88, traffic began to back up, waiting for the moment of reopening. Much of it was impatient skiers lured by the promise of fresh snow, and truckers with perishable loads. Allen threw all his equipment into the struggle, concentrating first on Carson Pass. Opening that stretch of road would allow skiers to reach Kirkwood and relieve some pressure. It was a slow, tough battle. In blinding snow Allen's drivers, following eight-foot-high snow stakes marking the right-of-way, could hardly see from one stake to the next.

In blinding snow Allen's drivers could hardly see from one eight-foot-high snow stake to the next.

It was Schindler's moment. Classified as a "lead worker" in bureaucratese, he is known among colleagues as the "avalanche king"; it is said he can examine any three snowflakes and predict when and in which direction they will slide. Schindler had been fighting avalanches at the Pass since 1972, when the road first remained open for the winter, and had announced his retirement after the 1998 season. Although no one took him completely seriously—"What in the world would he do?" Allen asks—January 4 would give him yet another chance to show his stuff.

Schindler gathered up four boxes of explosive charges and, accompanied by Mike "Sparky" Clark, piled into a snowcat and set off for the Spur. Behind him trailed Simpson in the Duck, Randy Gomes in another loader-blower, Ed Cova in a Snowblast, and Jason Dehoff operating a grader, ready to clear any slides.

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The light snow was ideal for the Gaz-Ex, and Schindler began with that weapon. Parking the snowcat just inside the avalanche zone, he radioed back to Girton to begin remote firing of the "cannons" far up the mountainside. Minutes later, Girton's voice crackled through the two-way radio. "Firing Charley One," he announced.

High up the mountain, through the curtain of white and against the leaden sky, could be seen a rapid flash. Then the explosion rumbled through the valley, echoing from mountainside to mountainside. "Detonation," Schindler said with satisfaction. "Firing Charley Two," Girton responded, and detonation followed detonation as he proceeded through the battery of exploders.

Holding back the road-clearance crews until he could survey the cannonade's results, Schindler moved the snowcat forward, the roadway barely discernible under its seamless coverlet of white. Within a few hundred yards his way was blocked by a mountain of snow. The "Charley One" Gaz-Ex had released a slide half the length of a football field and as high as a two-story house—"The whole mountain came down," Schindler said with barely concealed delight. Schindler backed and coaxed and chivied the snowcat and eventually climbed over the mound, only to meet another, smaller blockage produced by "Charley Two." Continuing down the buried road, he found five more road-covering slides, climaxed by one natural slide in a zone where an exploder was under repair

Joel Allen uses a shovel to sweep snow and ice off an elevation sign. Hikers frequent the area in summer, thus the sign beneath, warning against picking up unexploded ordnance.

and could not be fired. "That could have buried a car," Schindler grunted.

Schindler now turned the snowcat uphill onto an old logging road. Up, up, the vehicle climbed, through head-high drifts of trackless snow. At last it emerged on the ridgetop, well over 9,000 feet. Schindler maneuvered the snowcat along the ridgeline to its summit.

From this vantage point one could see perhaps 100 miles in every direction. But the punishing effects of the blizzard were obvious—and ominous. The powerful gusts sweeping over the ridgetop had built giant snow cornices overhanging the valley, threatening to break away and plunge toward the road, carrying more snow with them. The cornices were Schindler's current target.

Slowly, methodically, he and Clark began to arm the charges. Into each yellow, 15-inch-long cylinder containing a petroleum-based explosive and a blasting cap, they inserted a long red fuse, then topped it with a cardboard, pull-wire igniter and a safety clip. While Clark continued to arm, Schindler carried four charges at a time through thigh-high drifts to the brink of the ridge. He removed the safety and pulled the igniter, watched the charge spark, then tossed it over the bank. "It'll go in 78 seconds," he said. Sure enough, in precisely that time a loud report hurled up a spectacular fountain of white. Schindler threw his other three charges, returned to the snowcat for more and then steadily worked his way along the ridge, blasting down cornices as he went. He concentrated on the long Venturi Slide, a notoriously dangerous avalanche chute, and noted that it now seemed secure.

In all, he and Clark threw 92 charges. At chute 11, with the inoperative exploder, they set off such a barrage that Clark said, "It sounded like Vietnam all over again." By two-way radio, Schindler notified the road-clearance crews to move forward, and when the snowcat reached the road again, they had cleared a two-lane right-of-way as far as the Venturi Slide. Schindler waved to them as he continued to Caples Lake, and they finished opening the Spur and then, for good measure, helped the hard-pressed Peddler Hill crews by clearing ten miles of their territory.

After shuttling out a few drivers trapped by the road closure, Allen had been busy, too. He had launched a Gaz-Ex fusillade along the Pass near Red Lake, and then followed by hurling hand charges as high as he could up the Slabs and the Rockpile. Two slides reached the road. After they were cleared, Girton sent another bulletin, at 11:34 A.M., lifting the earlier closure. At 12:50 the Spur was reopened, too, and at 1:10, when the Peddler Hill section was cleared, trans-Sierra Route 88 was open from end to end.

Two hours later, it appeared that the opening could have been hasty. Headed back from Silver Lake on the Mason-Allen Line, perched high above the road in the Snowblast, Ed Cova suddenly found his way obscured by a new curtain of white. Cova, 67, who worked in shirtsleeves while chomping a cigar, had been explaining how the blower's rotary chewed up the snow and blew it away in 30-foot plumes, and shaking his head over a pair of chilled ice fishermen on Caples Lake. Then the snow descended and monopolized his attention.

The storm's last gasp added three inches to the total, bringing it to nearly 36 inches over the three days. Still, the highway was open, and the holidayers were smoothly wending their way home.

Allen looked out the window at the drifts and snowpiles across the maintenance yard, and shrugged an assessment of the storm. "Just average," he said. As he said it, he looked over his shoulder at the Doppler radar showing a new storm bearing down on him. A week later, almost five feet of new snow lay on Carson Pass.

In the August 1997 issue, Edwin Kiester, Jr., reconstructed the week of rain and subsequent flooding that struck Northern California last year. This is Tom Lippert's first assignment for SMITHSONIAN.

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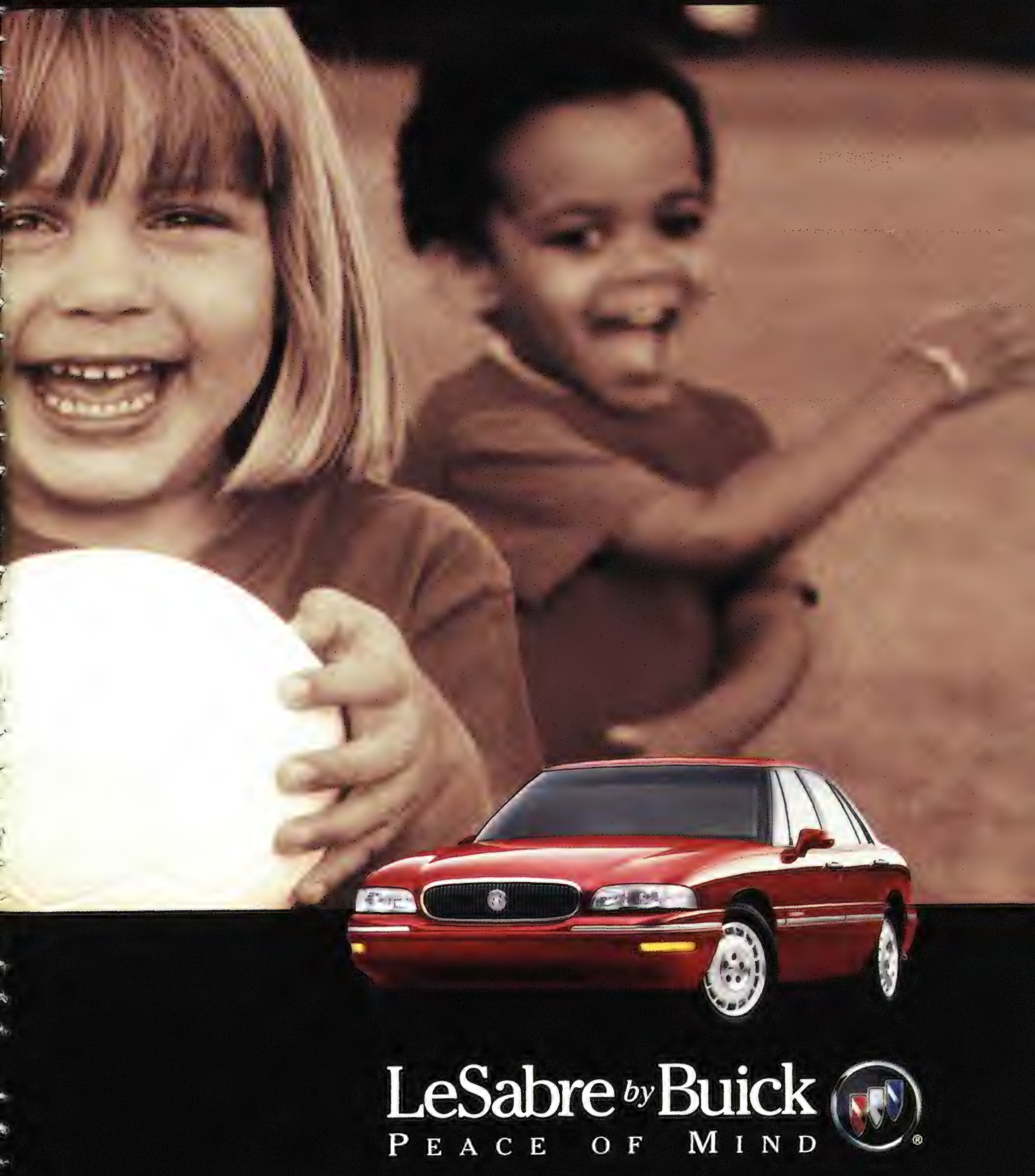

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PEACE OF MIND

R2-D2 Gets Real

Keep your eyes on the sky—a flock of robots may be heading your way

The helicopter in the left foreground, from Carnegie Mellon University, won this year's International Aerial Robotics Competition. Clockwise from it are the Air Force's much larger DarkStar, not shown to scale; an MIT entry; a UFO-like traffic-surveillance design from Georgia Tech; the balloon from Simon Fraser University in Canada; the Beast, from the University of Central Florida; and the Black Widow, designed by Aerovironment of California. The "flying insect" at center is the Georgia Tech Entomopter.

BY FRED HAPGOOD

THE FUSE WAS LIT ONE DAY IN OCTOBER 1996, when two students at Resurrection Catholic Secondary School in Kitchener, Ontario, mentioned to one of their teachers that they were thinking of doing something "challenging" for a class project.

John Dietrich, who teaches design at Resurrection, knew Dave Kroetsch and Pawel Lukaszynski well enough to catch the undertones when they used that particular word. Though still teenagers, the two friends had formidable reputations, inside Resurrection and out. Dave has his own custom electronics design business (Creative Solutions); Pawel is a licensed pilot. Both were known for cutting through problems with a flourish.

Earlier that year, for example, each student in Dietrich's class had been given a bag of parts and told to use it to build a vehicle that could run through a tunnel and pop a balloon. One of the tricky parts of the assignment was that the motor in the kit ran too fast. Most of the students tried to slow it down with rubber bands and a single pulley, which worked poorly, since rubber bands stretch. Dave had found a stick in the kit, sliced it lengthwise into thinner strips of wood, laminated these together to make a sheet, cut four wooden pulleys out of the sheet and built a transmission out of them. He had not just solved the problem; he had totally crushed it. That kind of performance was typical of them both.

So when Dave and Pawel said they wanted a challenge, something major league, something that would really force them to dig, Dietrich knew they were not thinking about building a lazy Susan or a birdhouse. Shortly thereafter the teacher ran across a video of a 1991 contest featuring aerial robots, machines that take off, fly and land automatically. Dietrich brought it in and showed it to the boys. Dave and Pawel remember being distinctly unimpressed. The aircraft moved awkwardly, accomplished little and often failed to get in the air at all. "We definitely thought we could do better," Pawel remembers.

That night, Dave found the International Aerial

The key attraction of aerial robots is that however hard they might be to build, they would be easy to fly.

Robotics Competition page on the Internet. The seventh annual event was to be held in July at Disney World, and for the first time, a separate contest for high school students was included. The next day he got together with Pawel to hammer out the pros and cons of entering. On one side, the tasks required (taking off from a small area, flying over a field, recognizing objects lying in the field, picking some of them up, returning to and landing at the original site) were best accomplished using a helicopter, and helicopters of any kind are very tricky to control. The video processing software, which the boys would have to write themselves, would not have been out of place as a research project in artificial intelligence. And even though they would be in a separate competition, Dave and Pawel would be flying their entry with aircraft built by undergraduates and graduate students from some of the best engineering schools around.

On the other hand, the contest combined everything the two were interested in—flying, hardware, software. It dealt with a real cutting-edge problem, something that mattered to the world and that was still wide open. Both of the young engineers felt it was time to try the boards on a larger stage, and the contest was certainly that. The contest was a full nine months off, and Dave and Pawel are of an age where nine months seems to leave room for a world of accomplishment. Besides, all the complexities just made the project more of a challenge, and that was the whole point in the first place. They sent in their application and started reading catalogues. Miniaturization made the job look doable. Off-the-shelf video cameras are so small, for example, that they are referred to as "postage stamp" or "lipstick" cameras.

The key attraction of aerial robots is that however hard they might be to build, they would be very easy to fly. For all the changes aviation has seen in the past hundred years, getting a heavier-than-air machine off the ground, flying it to a destination and landing it has always required high levels of skill. (Controlling a plane from the ground is no easier.) Though air travel is not a small in-

dustry, the need to have a skilled human attending every flight, whether in the cockpit or from the ground, has made many otherwise useful missions financially impractical.

Aerial robots come by the same skills electronically. Given a command to fly to B, the robot's computer, usually on the ground, would look up the location of B on a map carried in its memory. Then it would consult its armory of onboard sensors (altimeters, digital compasses, gyroscopes, cameras, motion sensors and so on) to figure out the robot's present position, heading and speed.

When those were known it would plot a course, calculate the correct flight maneuvers needed to assume that course, generate the appropriate control signals, send the signals to the motors controlling the flight surfaces, measure the results, and then calculate and send corrections as necessary. It would repeat this process several times a second until its sensors announced it had arrived at B.

While the term "autonomous" is often applied to these machines, there are degrees of autonomy, and these machines are not autonomous in the way birds and insects are. Directly or indirectly the original command to fly to B would have come from a human. It might have been stored in a program or issued in real time by a person sitting on the ground moving a joystick while watching a display. The important point is that the person giving the command doesn't have to get involved with any of the details about controlling the aircraft, like what the pitch of the rotor blades should be. All he or she needs to do is issue orders like "turn left," "fly to the Jones building and pick up a package," or even "follow that car." "Flying" this way is like "driving" by giving your car an address; it simplifies the process radically. For better or worse, a technology like that would open the sky to everyone.

The market for such devices is untested but looks handsome. The line of customers begins with the world's militaries. They have been using unmanned aerial vehicles, or UAVs, for decades for everything from target drones to cruise missiles. It continues with public safety agencies (police, fire), the news media, security services, real estate agents, mapping companies, contractors, farmers (who find it useful to monitor crops from the air), regulatory bodies, environmental managers, scientists, meteorologists, movie directors, architects and possibly even premium express freight companies, not to mention voyeurs, paparazzi, smugglers, terrorists and poachers.

Actually selling into this market raises complex policy questions about privacy, public safety, regulation enforcement (shooting violators out of the sky might not be practical in all cases), and visual and acoustic pollution. Until 1996, few people had to think seriously about these questions. In March of that year, a robot plane designed for high-altitude surveillance (named DarkStar) took off from Edwards Air Force Base in California. Schiebel Technology, an Austrian defense contractor, flew its Camcopter, a camera platform intended for close-up imaging, in late spring. In July a team from MIT flew an autonomous helicopter at the sixth International Aerial Robotics Competition.

That a few autonomous flights had been made over the summer did not make Dave and Pawel's task much simpler in October. Commercial engineers design their devices, including many of the pieces, from the ground up; this is expensive and time-consuming, but it keeps the supply and design of parts under the control of the project. Student teams, which have no money, scan catalogues looking for parts designed for other purposes that can be adapted or "hacked" for their own project. They then beg, borrow, or make sponsorship deals for those parts. Each design built by students is therefore completely different, since so much depends on exactly which parts have been wheedled out of which vendors.

Thus, at the start, a major fraction of Dave and Pawel's engineering skills had to be channeled into cleverer ways to beg. The Resurrection School

Pawel Lukaszynski, left, and Dave Kroetsch ready their HeliBot for the contest. The chopper carries a GPS receiver, a camera and a "grabber" to pick things up. Above: The Beast flies by balancing on the downwash from two internal propellers.

Friso Schlottau from the Rose-Hulman Institute of Technology tests his robot; the orange box on its left side is a computer. Right: Students from MIT (top) and Simon Fraser University monitor their computer base stations.

was hit up for the entrance fee and a camera. (To the boys' disappointment, the school was not willing to excuse them from homework assignments. "The teachers just didn't understand the importance of this," Dave says ruefully.) A hobby store in Kitchener offered the loan of a 12-pound model helicopter, which would be extensively modified. Pawel came up with the name of a guy who worked for one of the leading navigation equipment companies. A few phone calls and a sponsorship deal later and the largest single piece of hardware, the Global Positioning System (GPS) receiver, was in hand. It uses radio signals from 24 satellites to produce an extraordinarily accurate position reading.

Begging is cheap in the short term, but not being a paying customer brings its own risks. Early on the team had set their heart on a certain gyroscope made by a model electronics company in Israel. After some back-and-forth a complicated deal was worked out in which half of the $2,000 price tag would be paid up front but with the understanding that the company would buy the part back (less a $500 fee) after the contest. Unfortunately at that point the company got distracted. The FedEx truck came and went over the next several months, but no gyro.

During this time Dave and Pawel wrote the video processing software and the flight control programs that ran off signals delivered by the GPS equipment. They modified and fine-tuned the hardware that would drive the flight surfaces of the helicopter. They worked on the problem of picking up objects without the rotor wash blowing them away first. All of this needed to be done. But the gyro was critical. Stabilization is probably the hardest aspect of autonomous flight (a helicopter can tip over three axes at the same time), and the gyro was as central to solving that problem as the GPS was to navigation.

Finally, after many frantic transatlantic calls—for better or worse their design was by now committed to the Israeli part—the gyro arrived in June, only a month before the contest was to start.

At that point all the hardware was mounted on the model helicopter airframe. The students took it to a field, along with the computer that would fly the helicopter based on the information it received from onboard sensors and the GPS receiver. A skilled model helicopter pilot used radio controls to take it off the ground. One by one they worked on the four aspects of helicopter control: speed, roll, heading and pitch. Each time, the pilot kept control of the other three. When the copter began to get into trouble, the human would take over the fourth control and ease the little robot to the ground, where the boys would attack the glitch. By the time they had to leave for Orlando their machine, now called HeliBot, could handle itself passably well in all four parameters, though nothing was tuned as tight as the engineers would have liked. The team packed their Resurrection T-shirts, piled in a van and drove south.

Besides Dave and Pawel, 9 college teams turned up at the competition (14 had entered). In the high school competition, for which no other

If the object moved—perhaps because it was human—the machine would follow that person around like a dog.

teams showed up, autonomous flight was not a requirement; flights could be controlled from the ground. But Dave and Pawel had gone ahead and built their aircraft as if it were competing against the big guys, anyway. The University of Texas was showing a clever tilt-rotor design. Simon Fraser University in British Columbia had brought a scarlet blimp that looked like a huge piece of fruit. And the University of Central Florida was showing an artifact that looked much like an enormous garbage can and flew by balancing on the downwash generated by two internal counter-rotating propellers. It was called the Beast, and it made a hideous racket. When this was pointed out to them, the Florida team beamed happily and promised that the version they were planning to bring next year would be even noisier.

The other entries were helicopters. None of these machines had been built to local conditions, and that seemed to matter. The air in central Florida in July is very warm. This makes it thin, reducing lift, forcing the mechanical systems to run harder, hotter and more violently. That in turn subjects every physical link and connection to punishing levels of vibration. This fact, together with the basic complexity of the technologies, seemed to keep the machines breaking down everywhere. The computer on MIT's entry cracked during a perfectly routine landing. Another copter ran into a tree. Dave and Pawel's HeliBot flew but its camera died. The MIT team generously offered a replacement, but it was incompatible with the video software. The team from Resurrection ended up doing surprisingly well, anyway. Their robot's autonomous flight routines still worked, which wasn't true for everyone's. They ended up with 182 out of 200 points for innovativeness; high praise in that crowd.

The winning entry was a spectacular piece of engineering built by a team of students led by research scientist Omead Amidi from Carnegie Mellon. The video processing on this machine was so fast and reliable that the robot could steer visually: if it saw something of interest on the ground, it could bank, fly over to it, hover, focus its camera at the spot, and then descend straight down the line of sight as if on a guide wire. If the interesting object moved—perhaps because it was a human being in mo-

Most customers are going to want to fly these planes over settled areas; safety is the chief research theme.

tion—the machine would follow that person around like a dog.

Dave and Pawel were inspired, and already have a long list of improvements they intend to make for the contest this year. With Dave now at the University of Waterloo, they will be eligible for the college competition. They are not the only ones pushing the technology. A group working at Draper Labs at MIT—the winner of the 1996 contest—is working on building flying robots that can act socially, so that a group could fly as a flock, or congregate at a point and organize themselves collectively around a task. (A typical application might be search and rescue, in which the search robots would redefine their sweep geometries continuously as machines arrived or departed and more news about the nature of the emergency became known.)

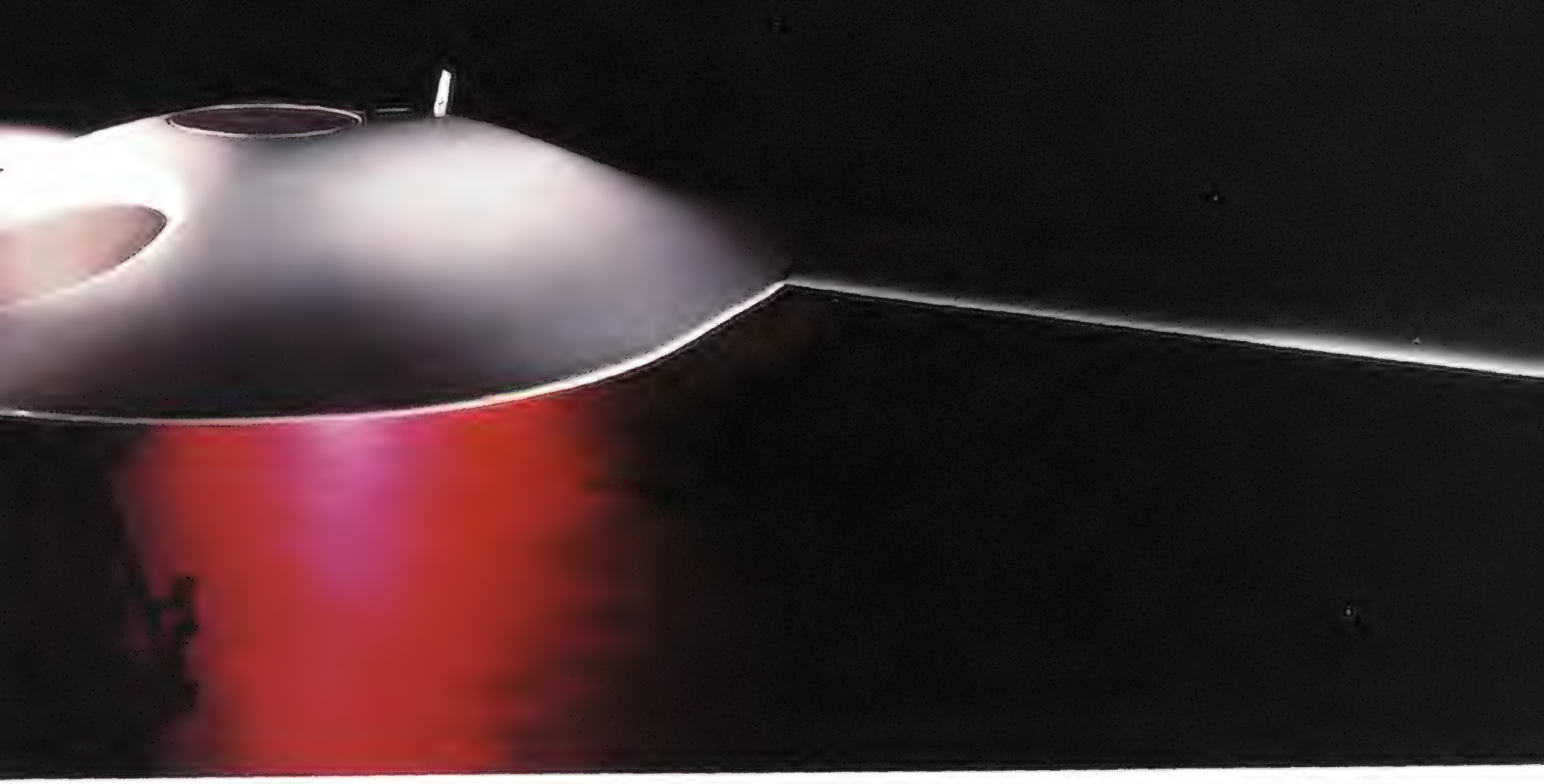
Last February a conference was held at the Georgia Institute of Technology to consider the issues involved with building "microair vehicles": flying robots with wingspans of six inches or less (which, amazingly enough, would include cameras). Robert Michelson, a professor at Georgia Tech (and the organizer of the aerial robotics contest), announced his intention of going to what he called an Entomopter: an imitation insect that is driven by flapping wings powered by artificial muscle. Michelson says he hopes a prototype will be able to achieve stable short-range flight by 1998. Georgia Tech is also working on a UFOish traffic-surveillance drone.

Another line of experimentation—the opposite end of microcopter development—is being explored by Aerobotics Corporation of Gloucester, Virginia, which is mounting autonomous controls into helicopter frames originally intended to hold two people. "If you can take the people out, you make room for payloads of hundreds of pounds," says George Makowiec, director of integration. Among other applications, large lifting capacities would permit the flying robots to carry very high quality cameras—cameras that could take video from so far away that the machine itself would be virtually invisible. This feature would appeal to agencies interested in surreptitious surveillance.

A third focus is on lowering prices. The Schiebel Camcopter costs about $530,000 (including a sophisticated ground station that can be used to control up to eight devices). Omead Amidi estimates that the Carnegie Mellon machine might sell in the $150,000 to $200,000 range. Aerobotics has just finished maiden flights of a helicopter it hopes to sell for under $100,000 and possibly much less. The trend is to smaller and cheaper. The MLB Company in Palo Alto, California, has produced the Bat plane, which has an 18-inch wingspan and carries a pair of video cameras. Aerovironment of Simi Valley, California, has come up with the Black Widow, a disk just six inches across.

Since most customers are going to want to fly these planes over settled areas (local police forces are one example), perhaps the most important research theme is safety. Three obvious concerns are atmospheric turbulence (being blown down onto the

Omead Amidi clasps his team's 100-pound winning entry; it would sell in the $150,000-$200,000 range.



The Air Force's DarkStar is a much larger aerial robot, with a 69-foot wingspan. The first model crashed in 1996, but another will fly later this year.

ground or into a building), midair collisions with other flying objects and equipment failure. At the moment there is no authoritative pronouncement on safety issues, since the FAA has released no regulations on the technology. One approach is to require humans to be involved at all times, give them lots of data and then leave it up to them to resolve any problems arising.

This represents the smallest possible departure from the current, pilot-centered, regulatory philosophy, but it makes some engineers, including Amidi, nervous. Amidi feels that autonomous aircraft ought to be required to perform to higher safety standards than piloted ones. For instance, he says, machines are better than humans at holding to a course in the face of random gusts of wind, since machines are always alert and their reaction time is faster. "We have had our aircraft in 40-mile winds and it was never blown more than a foot off the hover point," he says.

He believes this goal is compromised by relying on radio connections, which are subject to fading and interference (as in cell phones). While the risk of a crisis in the air and a breakdown in communications happening simultaneously is low, Amidi thinks it is still unacceptably high for a product that may someday be ubiquitous. His belief is that autonomous machines should be designed to handle their problems themselves, with onboard resources. Collision avoidance should be managed with obstacle detection, not by depending on a controller looking at a screen. Mechanical failures should be defended against with full redundancy of all flight systems (two motors, two rotors, and so forth).

"One reason I got involved with visual feedback was that I was convinced the technology had to have a backup to GPS," he said. Amidi's concern is that GPS is as vulnerable as any radio signal. His original intention was not to win contests but build what he calls a "visual odometer," a device that would allow a flying robot to infer its speed and bearing by tracking features on the ground, just like pilots.

Robot planes raise other issues less amenable to technological fixes. Will the targets of paparazzi ever be able to go outdoors again? Does the Fourth Amendment permit continuous surveillance of a person's property from the air? Sometimes a solution to one problem might interfere with another. Forcing the flying robots to be invisible from the ground, either by shrinking them or making them fly high, would address the issues of acoustic and visual pollution, but make the privacy issues even more difficult. Perhaps hardest to weigh is the effect on our relation to the sky. Through all our history we have looked at the sky without feeling that another human was looking back. That seems about to change.

On some level we have always known that when robots arrived some serious accommodations would be required. For decades we have been expecting them, always assuming that they would have legs or wheels and would run around on the surface. We have been looking down at our feet. This turns out to have been the wrong direction.

Fred Hapgood has written on subjects as diverse as clouds, directory assistance, the MIT media lab and viruses.

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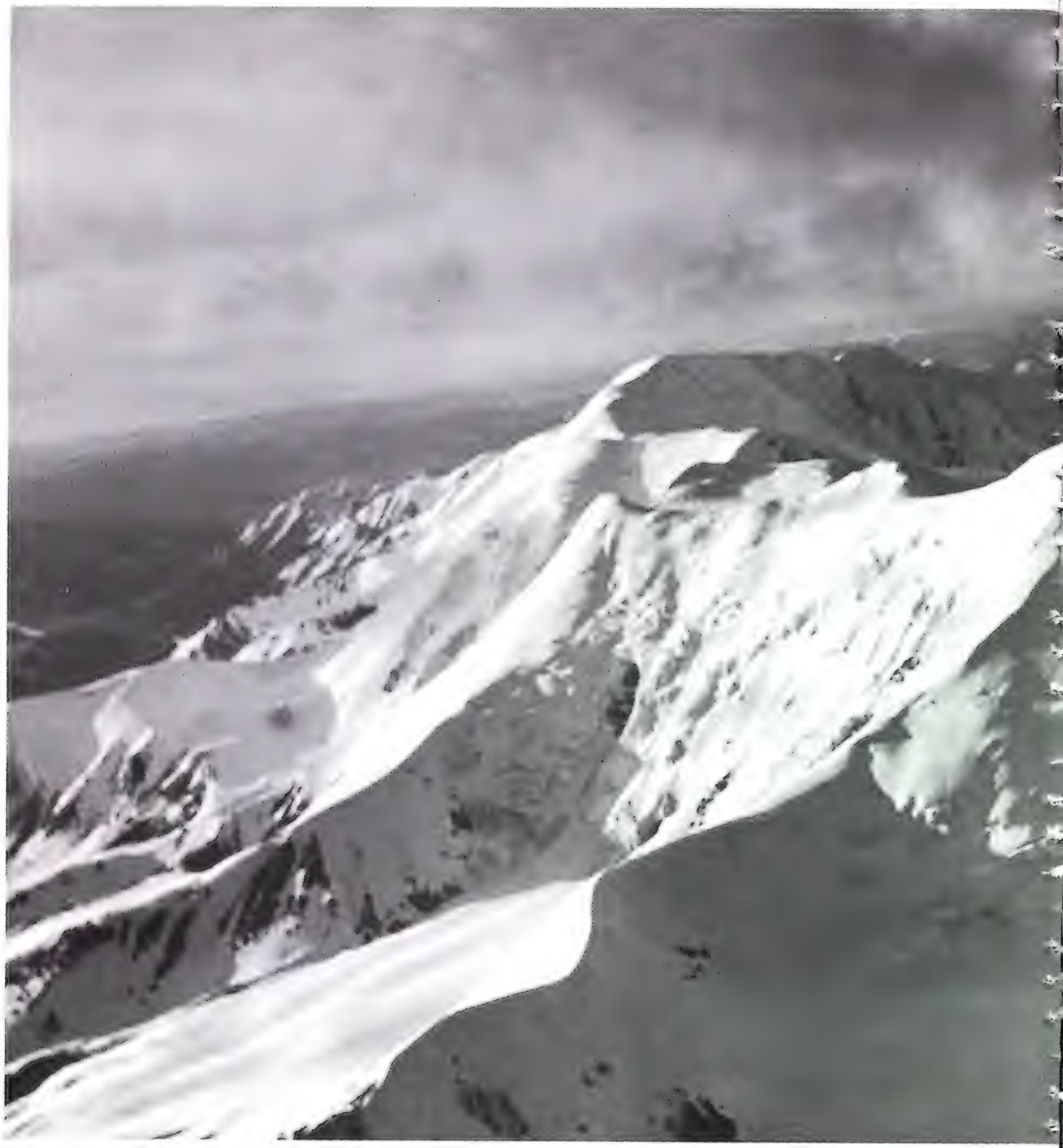

ON A BUNGLED FLIGHT TO NOWHER
THEY SOUGHT A CHINESE

When a ballpoint pen czar and a hotshot pilot went looking for the world's tallest peak, all they found was trouble

BY ROY ROWAN

TRIBES LIVING IN THE FOOTHILLS OF THE ANYEmaqen Range in wild and remote western China still sing an ode to the icy peaks above. They sing that Anyemaqen is a sacred mountain holding untold treasures, and that travelers who tamper with its mysteries will provoke divine wrath.

One of its darkest mysteries for many years was its height. Explorers found the mountain almost impossible to get near enough to measure. It is guarded on the north and west by sky-scraping plateaus, and on the east by the near bottomless gorges of the upper Yellow River.

In 1922 British brigadier general George Pereira, who probed this wilderness area, bequeathed a breathless report to future explorers. He told of a tremendous mountain that "towers above everything around." He had only glimpsed Anyemaqen's icy ramparts from afar, but he was convinced that its summit topped Everest's, at that time calculated to be 29,141 feet. His excited description proved irresistible to subsequent adventurers.

In January 1948 a team of Americans took up the challenge and embarked on a mission to end the speculation. Using a converted B-24 bomber christened the *Explorer*, which would be outfitted with state-of-the-art radar and aerial cameras, they would photograph and meticulously record Anyemaqen's height from above. These men didn't worry about upsetting the mountain's legendary deities. But looking back 50 years later at their ill-fated expedition, it appears that some kind of jinx must have contributed to the disaster it turned into.

Things started going awry right away. At that moment the adherents of Mao Tse-tung and Chiang Kai-shek were engaged in their bitter civil war. In fact, Lanzhou, the expedition's designated jumping-off point, 1,100 miles northwest of Shanghai, had already come under sporadic attack by Mao's troops.

The war didn't deter the American team. They were imposing figures, accustomed to surmounting all obstacles in their respective fields. Bradford Washburn, director of Boston's Museum of Science, and the world's foremost mapper of mountains, was picked to provide the expertise and aerial cameras.

Did the mysterious peaks of Anyemaqen (left) rival Everest's? Penman Milton Reynolds (inset, left) hired pilot Bill Odom to find out. But plans—and plane— got stuck in the mud.

MOUNTAIN HIGH

Today, at 87, he continues to be consumed with mountains. He is involved in plate-tectonics tests to prove that Everest not only still reigns as the world's highest peak but is growing steadily taller as a massive thrust fault pushes up from below. Washburn jumped at the chance to participate in the expedition.

Underwriting the expenses was Milton Reynolds, a multimillionaire ballpoint pen manufacturer from Chicago. He had come along planning to bask in the mission's publicity. What caught his attention was James Ramsey Ullman's prediction in his book on Everest that if Anyemaqen "is indeed higher than Everest, its discovery will rank as the most important geographical event of modern times." With that in mind, Reynolds assumed that a grateful China might rename the peak Mount Reynolds—the ultimate promotion for his pens.

The third member of the team was Bill Odom, a 28-year-old, seat-of-the-pants test pilot who had recently broken Howard Hughes' round-the-world speed record—also with the

Odom and a pen-laden Reynolds scan maps before the flight. Below: Radar expert Walt McKay, left, and mapmaker Bradford Washburn provided scientific muscle.

financial backing of Reynolds, who had gone along purportedly as "navigator." Odom's new dream was "to swoop and soar around those forbidding peaks of western China where few pilots have ventured before."

As *Life* magazine's bureau chief in Shanghai, I became personally involved with this triumvirate. My first contact was with museum director Washburn. He appeared at my office lugging a big K-6 aerial camera—plus a sleeping bag. Sheepishly, he asked if he could bed down on the office floor to save his museum the expense of a hotel room.

Fortunately Washburn kept a detailed diary, venting his frustration on nearly every one of its 134 pages. That's how, 50 years later, it is possible to unravel this tale of a geographic exploration gone haywire.

Washburn had also brought with him an article by Dr. Joseph Rock, published in 1930. An American botanist, famous for his plant-gathering forays, Rock, in 1923, bumped into Pereira, who told of the towering peak he had seen. Six years later when Rock glimpsed the mountain himself, he determined by rough sightings and altitudes calculated from the boiling point of water that it was indeed some 500 feet taller than Everest.

Washburn, nevertheless, remained skeptical. Still, he was determined to accumulate every available scrap of information. He enlisted the help of Dr. Sah Pen-tung, the head of China's Academia Sinica, the government-sponsored scientific institute. Sah, in turn, secured the help of two other research institutions. They created a new map for Washburn that he said was the "most complete combination of all known information on the Anyemaqen area."

The Communists greeted Washburn's preliminary efforts with one of their typical anti-American tirades. "They are really coming to hunt uranium for the manufacture of atomic weapons," screeched the Red radio. "Any member of the expedition that falls into our hands will be immediately decapitated."

Worried less about losing his head than his stomach, from the boiled sea slugs, fried grasshoppers and other exotic dishes served at a never-ending series of dinners hosted by the Chinese scientists, Washburn ultimately worked out a formal agreement with them, stipulating that the flights would be a joint Chinese-American endeavor. Chinese scientists were to accompany each flight.

Next, Washburn set about obtaining logistical support. After days of negotiations (and more dinners) he was able to make refueling arrangements for the *Explorer* in Lanzhou.

With this groundwork laid, Milton Reynolds, the expedition's backer, burst upon the scene, seemingly more intent on promoting his "atomic pens" than in measuring Anyemaqen. Ballpoints were then a great novelty. And while Reynolds falsely claimed to be the pen's inventor, he had built a quick fortune by retailing for $12.50 what cost him 33 cents to manufacture. *Time* magazine reported that at one New York City department store alone, "thousands of customers all but trampled one another to buy what was advertised as the fantastic, atom-

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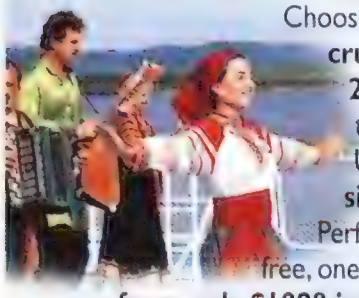

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ic era, miraculous pen that needs refilling only once every two years, and can write under water, on paper, cloth or plastic."

Reynolds almost started a riot one day in Shanghai by giving away 50 pens on a busy street corner. Emerging from his car with yellow pen cartons sprouting from every pocket, he stopped a passing pedestrian and offered him a free pen. In less than a minute he was ringed in, and three minutes later was cowering in a gateway while hands clawed at every pocket. Urchins climbed on their parents' backs or burrowed between their legs. Rickshaw boys put down their shafts to join in the treasure hunt. Even two policemen who came to investigate were soon scrambling for pens. After ten minutes, a hatless Reynolds, picked clean, pried himself free of the mob.

At a quick succession of press conferences, Reynolds claimed that plans were already afoot to manufacture his pens in China. He promised to retain only a modest royalty for himself. His first "gift of friendship," he announced, would be 10,000 pens for Madame Chiang Kai-shek to sell to raise money for her charities.

The generalissimo's wife invited Reynolds and Washburn to tea. Wrote Washburn: "I could see Milt falling in love with her as we sat in front of a blazing fire in the great living room with leopard skins draped over the chairs and a giant panda skin spread out in front of the fireplace."

Initially, Reynolds' whirlwind appearances provided a pleasant diversion from the civil war. Blossoming forth in a gaudy safari suit with gold-and-green insignias on each shoulder and shiny brass braid on both breast pockets, the short, balding 55-year-old pen manufacturer became instantly recognizable wherever he went. He claimed to have had the uniform made so he could send his only other suit out for dry cleaning. Obviously, though, he was trying on for effect

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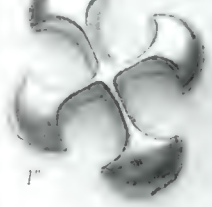

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Passersby scramble for ballpoints in a melee Reynolds precipitated when he gave away his "wonder pens" on a Shanghai street.

the uniform he intended to be photographed in upon his triumphant return from Anyemaqen.

As the penman's fame spread throughout China, he started referring to himself as a "modern Magellan," an explorer "eternally seeking new frontiers." Although he didn't come right out and suggest that Anyemaqen be renamed Mount Reynolds, he reminded reporters that Everest had been known by its Tibetan name, Chomolungma, until the Welsh surveyor, Sir George Everest, made the trigonometric measurements that established it as the world's tallest mountain.

Newspapers in China quickly got the hint and tweaked Reynolds in a flurry of editorials. "Our mountains are named after famous men," one paper pointed out. "Thus we have Tai Shan named after Confucius and Wu Tai named after Buddha. But here is Mr. Reynolds, holding an atomic pen in hand, coming to seek his fame from a Chinese mountain."

The needling didn't faze Reynolds who, though he reveled even in bad publicity, had flown back to the United States to find out why it was taking Odom so much time to reconfigure the B-24 bomber for its long-range flights. Washburn had already come to realize that Reynolds was the only one who had any control over the headstrong pilot.

Meanwhile back in China, Washburn had become increasingly embarrassed by Reynolds' pronouncements. "The man's ego is fantastic," he noted in his diary. "He leaves a very bad smell everywhere he goes."

Six weeks later, the ballpoint pen king finally returned with Odom and his crew aboard the *Explorer*. There was

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no mistaking its mission. "REYNOLDS BOSTON MUSEUM CHINA EXPEDITION" was painted in bold black letters on its fuselage. Outfitted with auxiliary gas and oxygen tanks, the plane also carried 750 pounds of pens. But mechanical problems became instantly apparent. There was no heat in the nose where the camera would be located. "Impossible to work up there. Sure to be colder than the South Pole," Washburn wrote. "Besides, the leaky new oxygen system has us all pretty mad." When it was discovered that the wing tanks were leaking gas, Odom decided to fly the plane back to Los Angeles for repairs. That work, including a little rest-and-relaxation time in Honolulu for Odom and flight engineer T. Carroll Sallee, ate up three more weeks.

"Dr. Sah has already lost all faith in us," noted Washburn. But Easter morning Reynolds cheerily announced, "We're off to Anyemaqen." Unexpected bad weather forced Odom to land in Beijing.

Because Communist forces were reported to be holding the surrounding countryside, he swooped low over the Forbidden City to avoid being shot at, before landing on a runway that Washburn nervously observed was "lined with Chinese Air Force P-38s, P-51s and B-24s, loaded with honest-to-god bombs."

When departure for Lanzhou was postponed the following day, Washburn was appalled to discover that Odom had tried to talk Reynolds into slipping aboard one of the B-24s and going on a bombing raid over Manchuria. That wasn't surprising as Odom had an insatiable appetite for excitement. After shattering Howard Hughes' globe-girdling speed record, he wanted to do it again, but this time on a bipolar orbit. Washburn was more discouraged than ever. And he was now convinced that Reynolds was probably crazy. He wrote in his diary: "The hotel doctor in Beijing

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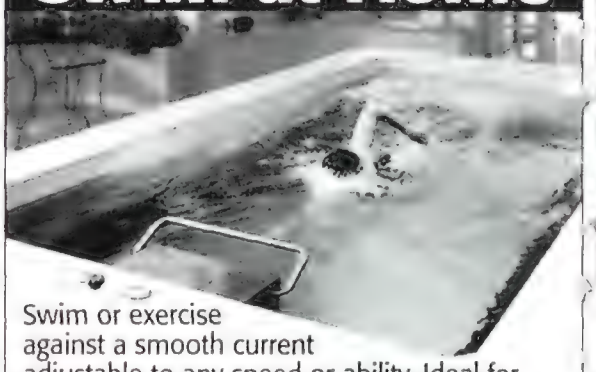

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who met Reynolds socially last night, says that he's clearly a psychopathic case, a 'megalomaniac with a strong tendency toward schizophrenia and undertones of paranoia.'"

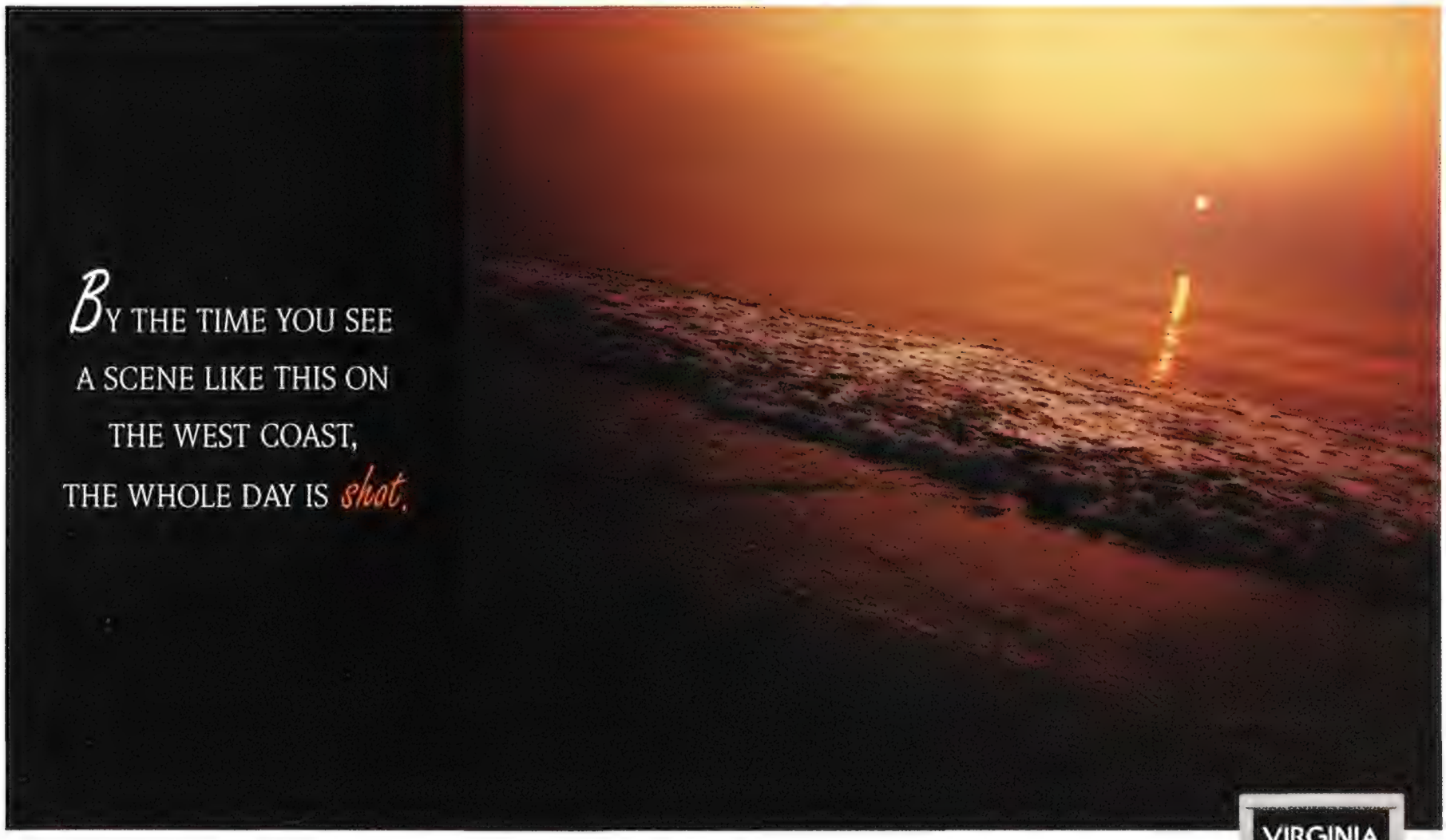
Finally on March 31, their third day in Beijing, everybody was strapped in their seats aboard the *Explorer* ready for takeoff. The weather report was perfect. "But, this should have been April Fool's Day," Washburn wrote in his diary. "Taxiing from the brick apron where the *Explorer* had been parked, Odom turned the plane too sharply to get onto the concrete runway. The right wheel sank deep into the mud. There was a dull thud, and then silence." The right wheel had practically disappeared and the whole right side of the plane rested on a crumpled propeller blade.

Wearing oxygen masks, author Rowan, left, and other journalists scribble and type notes during their flight over Anyemaqen.

"The expedition is over," Reynolds announced quite abruptly. "Captain Everest has won again." He offered no apologies to the Chinese scientists, some of whom had gone ahead to Lanzhou and were patiently awaiting the *Explorer*'s arrival.

Odom didn't appear disturbed; that simply wasn't his nature. Once when piloting large flying boats between the United States and Puerto Rico, he made a forced landing in the Chesapeake Bay. While he and his 82 passengers waited to be rescued, Odom reportedly complained of boredom because they didn't have fishing rods.

Two days later the Anyemaqen expedition was miraculously back on track. "Odom came into breakfast," Washburn noted hopefully, "with news that the *Explorer* has been jacked up and is OK."



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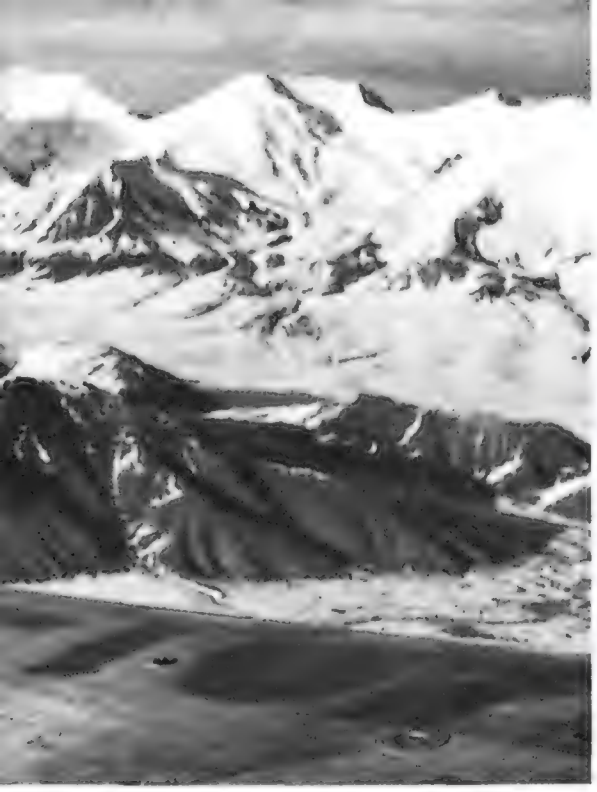
Flying perilously close to Anyemaqen's peaks, Moon Chin almost grazed the mountains' icy flanks with the wingtip.

"Actually, the plane hadn't been jacked up," Washburn recalls. "Some three dozen coolies, using picks and shovels, very cleverly dug a hole under the left wheel to level the plane, and then carved out a ramp so that Odom could rev up the three good engines and taxi onto the runway."

After that, the museum director's diary quickly reverted to its bleak tone. "The kaleidoscope shifts again," he wrote. "Odom and Reynolds flew off to Shanghai this afternoon on three engines after the CAF refused to lend them a propeller." Not only had they departed without paying their hotel bill, but an angry telegram came from the Chinese scientists stranded in Lanzhou claiming that they were being held hostage because of Reynolds' failure to pay theirs.

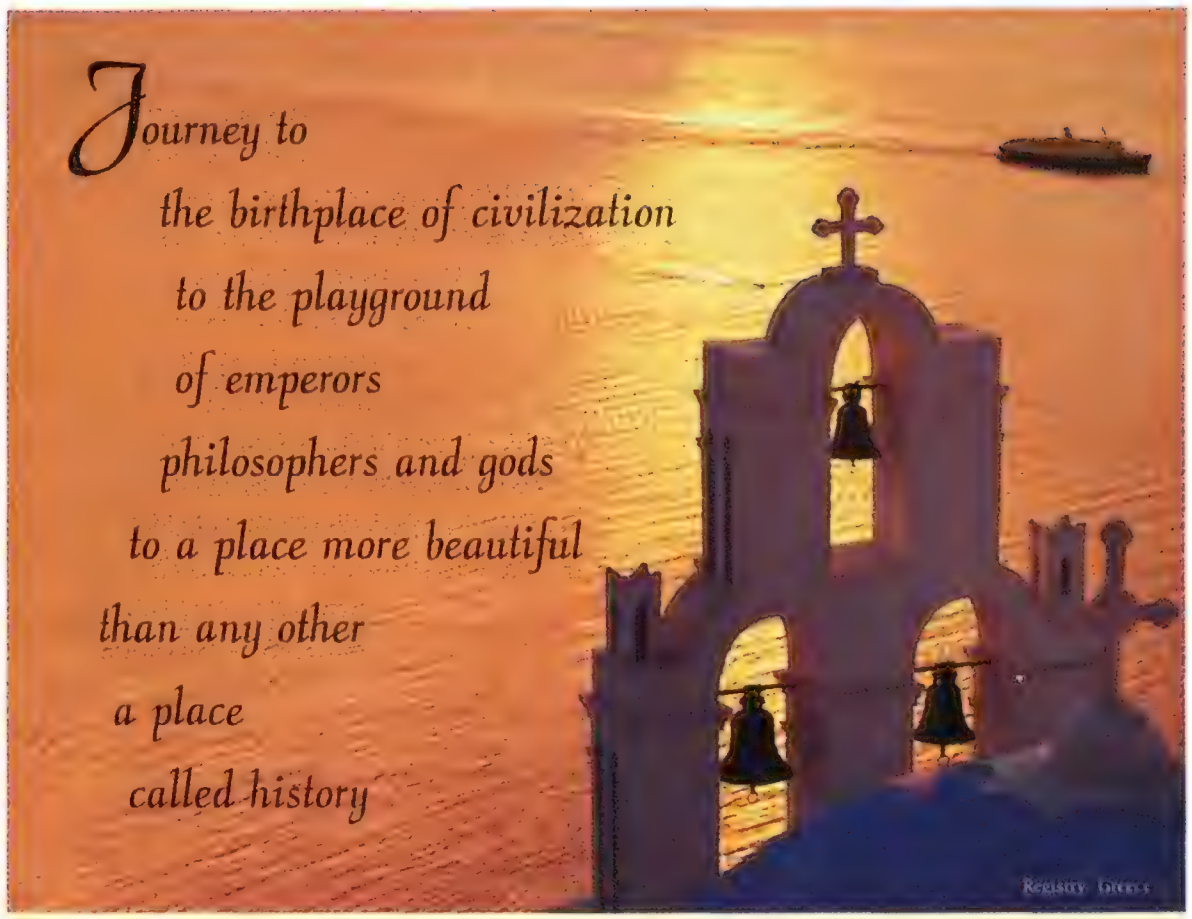
When Washburn got back to Shanghai by commercial plane, he was greeted with a newspaper headline reporting that after obtaining a replacement propeller, Reynolds and Odom had suddenly taken off for the United States. Surprisingly, though, their flight plan stated: "Destination Calcutta." Thirteen hours later the *Explorer* was back in Shanghai. "We tried to fly home via India," Reynolds lamely explained to the press. "We turned back after almost seven hours in the air when we suddenly real-



ized that none of us had Indian visas."

"A really fishy story if I've ever heard one," noted Washburn. "Obviously, they looked for the mountain and failed to find it." When Washburn relayed the stunning news to Dr. Sah, the Academia Sinica director charged Reynolds with "deliberately freezing out the Chinese scientists and then sabotaging the expedition." He demanded the penman's arrest and ordered the *Explorer* impounded. Reynolds tried to cajole Sah into releasing the plane. Contritely he admitted that he was "guilty of negligence" and offered "to fly an all-Chinese party over Anyemaqen." Sah rejected the offer but agreed to allow the *Explorer* to be refueled after Reynolds convinced him that it was necessary to keep the empty gas tanks from corroding. In return, Reynolds promised to remain in China until his quarrel with the Academia Sinica was settled.

But Milton Reynolds still had some tricks up his sleeve. Promising the armed sentries guarding his plane a box of ballpoint pens, he and the *Explorer*'s crew were permitted to go aboard. Then, as Reynolds described their escape from China to reporters in Tokyo: "We climbed in and I threw out 50 pens and slammed the door. Pilot Bill Odom gunned the plane. As more Tommy-gun-toting



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guards came running, Odom turned on one wheel and roared down the runway in a daring, down-wind take-off, scattering the guards." Reynolds also claimed that on the radio they heard the Shanghai airport alerting a fighter squadron to chase them. "So for the first 350 miles we flew about 20 feet above the water," he said.

Infuriated, Washburn got the U.S. consul general in Shanghai to contact General MacArthur's headquarters in Tokyo in an unsuccessful attempt to have Reynolds returned to Shanghai to answer to the Chinese authorities. He noted in his diary that "even the Reynolds Aluminum Company, which has a plant in China, is afraid its good name is being besmirched. Today it placed a full page ad . . . disclaiming any connection with the Reynolds Pen Company."

"Good riddance," sang the Chinese newspapers, which facetiously thanked Reynolds for furnishing some "comic relief from the war against the Communists."

The Reynolds affair had aroused the curiosity of one of China's ace airmen, Moon Chin. Raised and trained in Baltimore, he, like Odom, was among the original Hump fliers, who traversed the mountains between India and China; Chin was picked by Chiang Kai-shek to be his personal pilot. Washburn had arranged to hire Moon to serve as the *Explorer*'s co-pilot. But Odom haughtily refused to have a "Chink" in his cockpit. Washburn still believes Odom wouldn't have run off the apron and gotten stuck in the mud if the Chinese pilot had been there to guide him.

As vice president of operations for the Central Air Transport Corporation, Moon decided to look for himself. "I think we might detour a bit and have a look at this mountain that's causing so much commotion," he drawled in his Baltimore accent. "I don't think it's as high as Mr. Reynolds claims."

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gen equipment, Moon Chin took off on the daylong first leg to Lanzhou. Aboard were 14 newsmen, including *Life* photographer Jack Birns and myself. Everyone carried a portable oxygen cylinder and a parachute, though God knows for what. If the engines conked out over the frozen wilderness, we might just as well have bailed out without one.

An hour after leaving Lanzhou, the headwaters of the Yellow River appeared far below, snaking through its deep upper gorge. Using a barely discernible trail as a reference, Moon Chin turned the airplane on a course for Anyemaqen.

The rear door of the C-46 had been removed so the photographers could take unobstructed aim at the soaring peaks with their aerial cameras. Lugging oxygen cylinders behind, and harnessed with safety straps hooked to their belts, they were able to work precariously close to the open door.

When the first snow-covered peaks started poking up at our plane, Moon flew straight into them, almost scratching some of the icy escarpments with his port wingtip.

By this time we were flying at 18,000 feet. Jagged peaks were soon jutting up all around us. But not one of these pinnacles came close to the height of the mountain described by Pereira or Rock.

Visibility was excellent. A dome-shaped peak loomed ahead in the precise spot where the map showed Anyemaqen. Moon climbed to 19,000 feet, almost the same height as the mountain, and did a lazy 360-degree turn around its frozen summit. This appeared to be the highest peak in the whole range. "Two myths ballyhooed to the skies by Milton Reynolds are hereby exploded," I wrote in my notebook. "Mighty Anyemaqen contains neither gods to repel its trespassers, nor a peak to rival Everest."

On his return the Chinese press congratulated pilot Moon Chin. "When Moon came over the moun-

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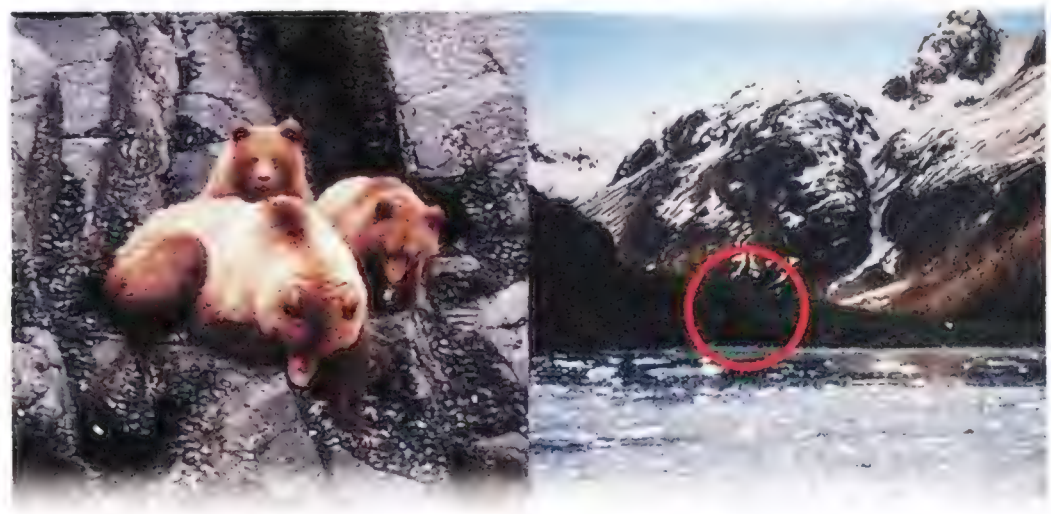

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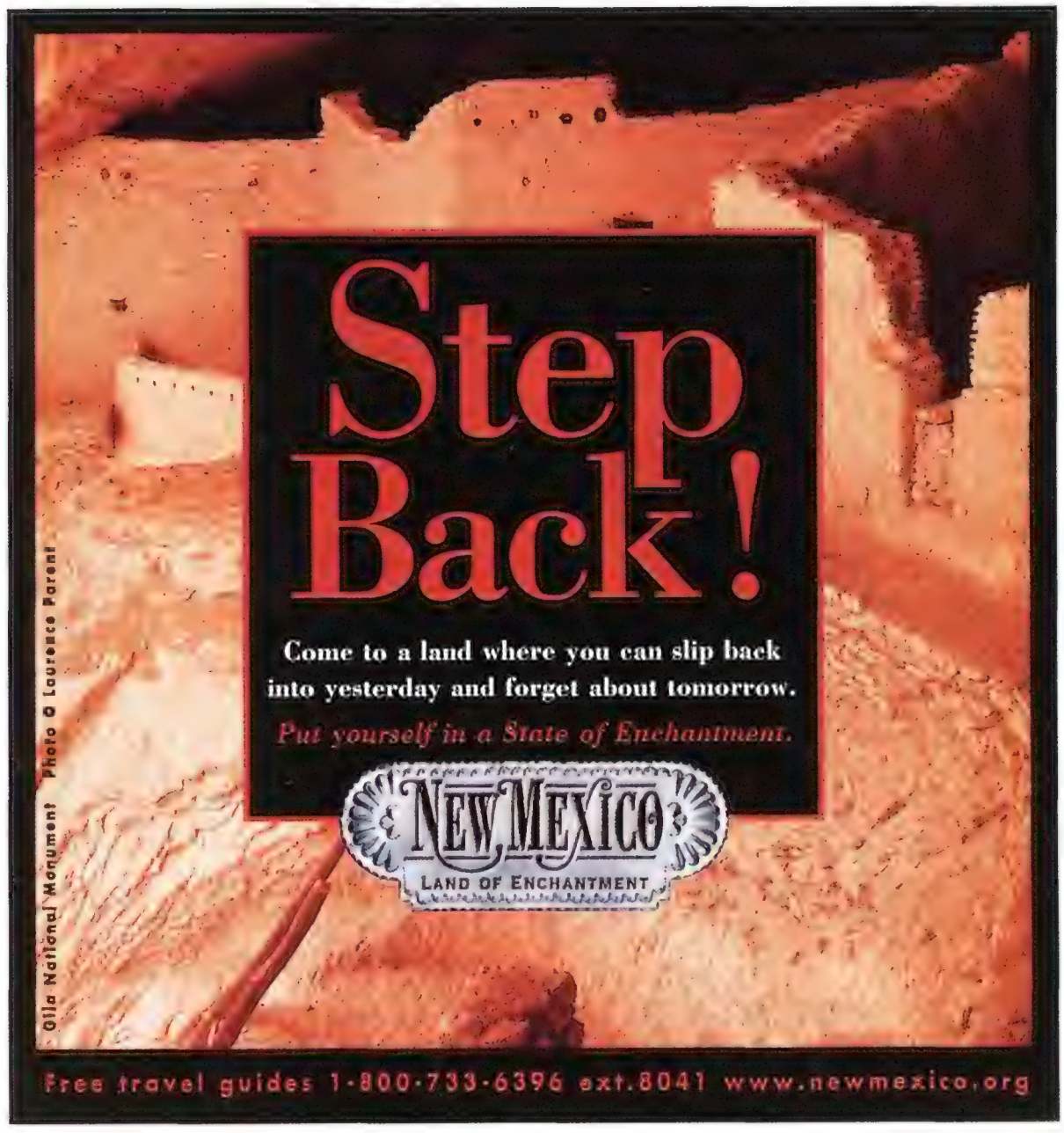
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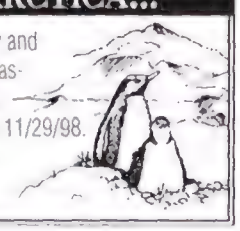

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A little more than a year after his Anyemaqen adventure, daredevil Bill Odom was killed when he flew his plane into a house during the 1949 Cleveland air races.

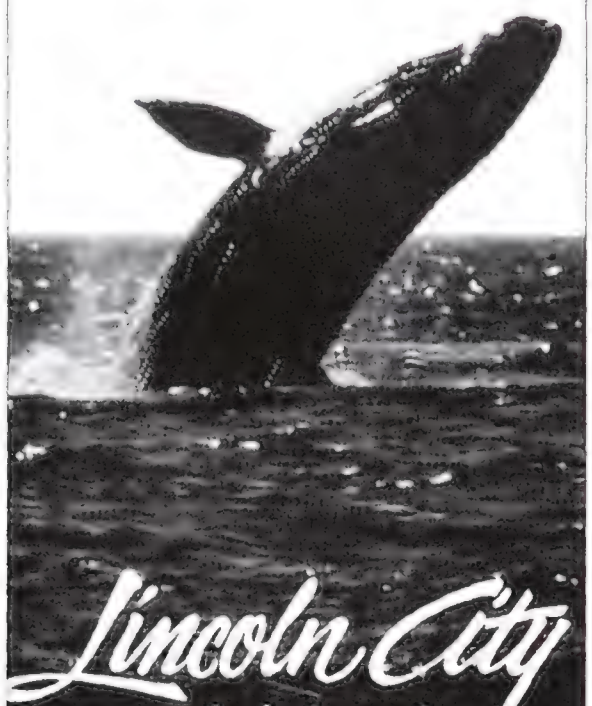
tain, he put the millionaire Magellan from Chicago to shame."

But the confusion and mystery enshrouding Anyemaqen was not that easily dispelled. Believing that Moon Chin had missed the mountain, a daring American explorer, Leonard Francis Clark, mounted an overland trek the following year to find it.

In a long article published by *Life*, Clark wrote: "By the calculations I made, the peak stands 29,661 feet above sea level, 520 feet higher than Mt. Everest." The U.S. Coast and Geodetic Survey, however, reported that Clark's computations could have been off by 16 percent. And Washburn, after studying the snow formations in Clark's pictures, said the mountain could not have exceeded 24,000 feet. In the 1970s Anyemaqen was scaled by a Chinese expedition, which claimed it to be 20,610 feet high.

Even though Anyemaqen fell far short of being the king of all mountains, it did appear to unleash its divine wrath on many of those who tampered with its mysteries. Shortly after returning from his arduous trek

The wind isn't all that blows around here.



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in the summer of 1949, Clark was shot during a barroom brawl. About that time, the Academia Sinica director, Dr. Sah Pen-tung, died of cancer. Then in September 1949 Bill Odom was killed while competing in the Thompson Trophy air race in Cleveland. The daredevil pilot turned his souped-up P-51 Mustang too sharply rounding one of the pylons. The plane flipped over and dove into a house, also killing a woman and her baby son. Odom, who had only one previous pylon race under his belt, had admitted to a reporter, "I don't belong in this thing. I'm used to flying high off the ground."

Milton Reynolds tried to redeem his own reputation by funding five aeronautical fellowships at Stanford University in his and Odom's name. But his credibility as an explorer was destroyed, and as a ballpoint pen magnate eroded, as his company soon was eclipsed by several competitors. After reportedly encountering tax problems, Reynolds moved to Mexico. He died in 1976. "He was one of the last great pirates," says Thomas

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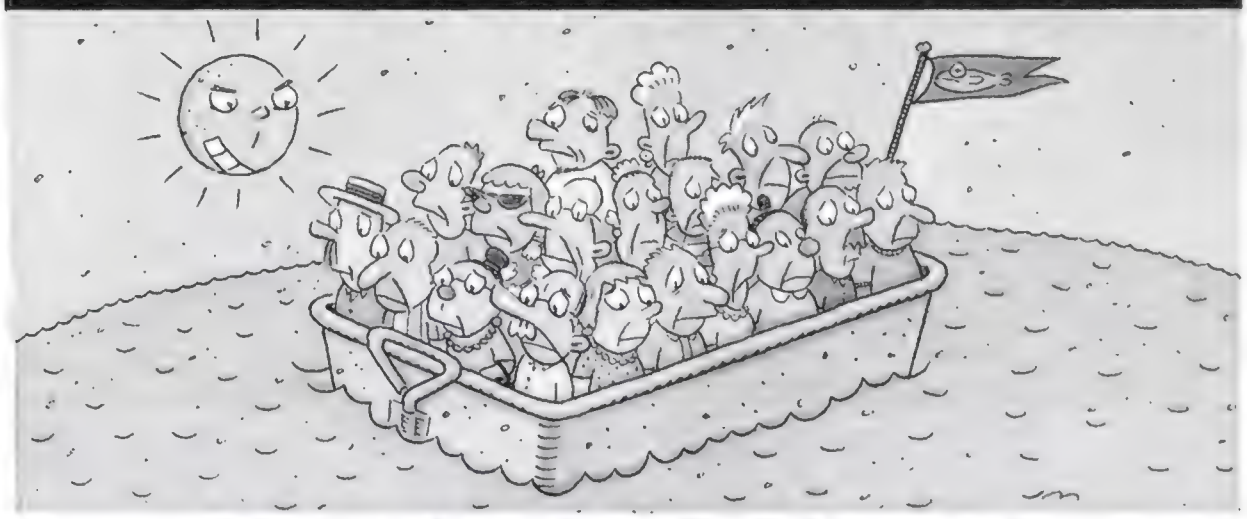

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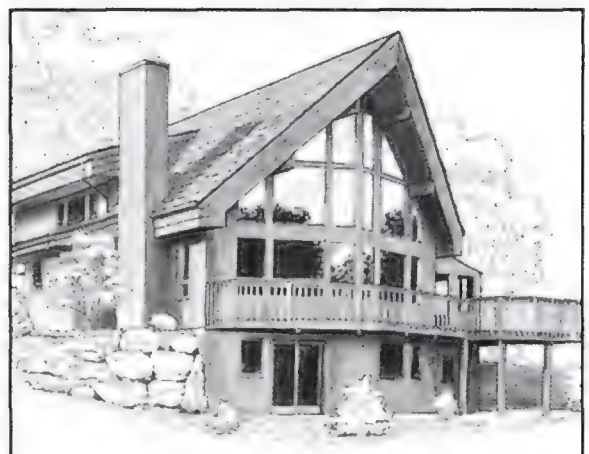

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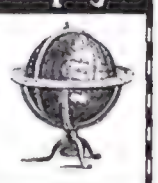

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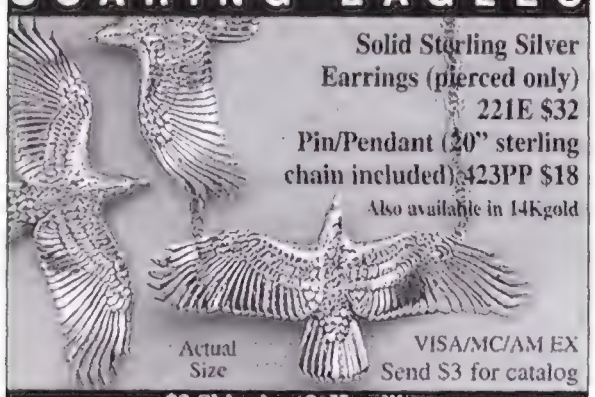

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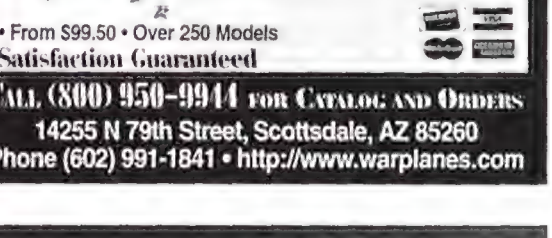

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"I don't belong in this thing. I'm used to flying high off the ground."

Reynolds, who remembers his grandfather affectionately as a "whirlwind operator and tall-story teller."

Looking back on the abortive expedition, Brad Washburn blames its failure more on Odom's unwillingness to have Moon Chin in the cockpit than on Reynolds' egomania. The mystery of what happened on their sneak attempt to find Anyemaqen after pretending to take off for Calcutta was finally cleared up by flight engineer T. Carroll Sallee, whom Washburn bumped into months later in Boston. "Two hours past Lanzhou, heading for Anyemaqen," Sallee explained, "we encountered a cloud buildup that rose higher and higher until it reached 30,000 feet. Caught in that overcast, Odom finally turned the *Explorer* around and headed back for Shanghai."

Despite all the frustrations, Washburn still remembers his three months in China as "a fascinating interlude. Of course," adds the scientist, whose long and preeminent career is now devoted almost entirely to the ultraprecise mapping of Everest, "it seems much more thrilling to me today than it did then."

Still, the contacts he made in 1948 with Dr. Sah and the Chinese scientists have proved very helpful. Even now, as Washburn participates in a new project that involves implanting steel expansion bolts near the peak of Mount Everest so its slowly increasing height can be measured by satellite, he often needs assistance from China. "The ruckus raised there by Reynolds," he says, "has long been forgotten. The real tragedy of Anyemaqen is that it turned out to be so darn much smaller than Everest."

Roy Rowan's most recent book, First Dogs, *a history of Presidential pooches, was featured in the June 1997 issue of* SMITHSONIAN.

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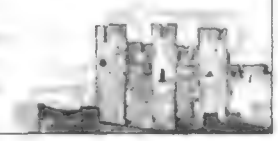

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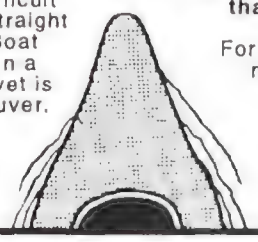

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Cotswolds Walks (England) *September 3-12*

Odyssey of Flight (England) *September 3-14*

Celtic Treasures (Ireland and Wales) *September 3-14*

Spanish Legacies *September 3-14*

Cruising Norway's Western Coast *September 3-15*

Islands of the Gods (Greece and Turkey) *September 7-20* Aboard the *Panorama*.

Seine River (France) *September 8-19* Aboard the *Normandie*.

Peru: Empires of Gold *September 10-24*

Greece by Land and Sea *September 10-25* Aboard the *Galileo Sun*.

Legendary Landscapes of the Yangtze River *September 10-28*

Danube River Journey *September 15-28* Aboard the *River Cloud*.

London and Paris via the Chunnel *September 16-25*

Provence: Cruising the Rhône River (France) *September 18-28* Aboard the *Cézanne*.

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Hudson River Homes and Gardens *June 7-13*

NEW! **Minor League Baseball (North Carolina)** *June 18-21*

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Exploring Alaska's Inside Passage, from Sitka to Juneau *June 26-July 4* Aboard the *Sea Lion*.

Alaskan Landscapes *July 12-22*

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NEW! **Rocky Mountain Hiking (Colorado)** *July 18-25*

Railroading the Rockies (Colorado) *July 18-27 or September 19-28*

Santa Fe Music and Gardens (New Mexico) *July 20-26*

Hiking Idaho's Sawtooth Mountains *July 25-31*

Wild Newfoundland *July 31-August 7*

Smithsonian Seminars

Concentrated study of specific topics:

Civil War Forum (Nashville) *June 3-7*

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Carmel Bach Festival (California) *July 25-30*

NEW! **Rodin: Passions in Bronze and Marble (Quebec City, Canada)** *July 29-August 2*

NEW! **Chautauqua: American Music (New York)** *August 2-8*

Oregon Shakespeare Festival *August 25-30*

Oxford/Smithsonian Seminar (England) *August 29-September 12*

Telluride Film Festival (Colorado) *September 2-8*

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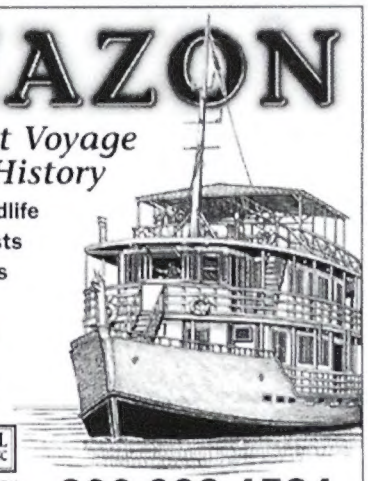

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THE LAST PAGE

Notes About Not Much

BY BOB SEIDENSTEIN

THERE'S NO BETTER WAY TO MAKE YOURSELF FEEL like an underachiever than to read the "class notes" section of an alumni magazine. Why aren't you the ambassador to France? How come you haven't won the Nobel Prize for chemistry?

This is fairly typical of the things that appear in my alumni quarterly: "*John Smith* ('92) has sold the movie rights to his latest best-seller for $10 million. The novel, based on his adventures sailing the Pacific, has been nominated for a National Book Award. John will be portrayed in the film by Brad Pitt. John splits his time between his penthouse in New York and his homes in Aspen and Nantucket." How do you think that makes me feel? After 20 years in the workforce, I've finally gotten an office with a window. It overlooks a parking lot.

After hanging in there for almost four months, Janey Jones ('68) finally finished reading Ulysses. She tries to read a book a month but is often interrupted by junk phone calls.

Careful readers will have noticed a dangerous new trend: editors are allowing graduates to brag about getting married and having children. That marks a healthy shift away from honors and promotions as yardsticks of success, but such announcements read as if getting married and having children are recent inventions. This trend also gives those who report their every little career move something else to gloat over. Those people, of course, are the ones you never wanted to know anything about in the first place. They are also the ones who always had their hands up in class.

What's needed now are class notes for the rest of us. Just because we happen to be mired in mediocrity does not mean our lives aren't worth mentioning, too. I hope the day isn't far off when we will be able to pick up the *Alumni News* and encounter items like these:

◆ *Edgar Filbert* ('74) is having a midlife crisis; he got a hair transplant and recently bought a red sports car.

◆ *Mary Jane McGillicutty* ('65) won $246 in the state lottery. Her winning numbers were 3, 7 and 8. Mary Jane, who plays the lottery often, dreams of striking it rich and retiring from her boring job as a chemist.

◆ *J. Chauncey Johnson III* ('79) still thinks he should have been admitted to Yale.

◆ *Ruby Applegate* ('76) hired an expensive lawyer and took her husband for all he was worth in their recent divorce. She now resides in Palm Beach with a water-ski instructor.

◆ After hanging in there for almost four months, *Janey Jones* ('68) finally finished *Ulysses*. She tries to read a book a month but is often interrupted in the evening by junk phone calls.

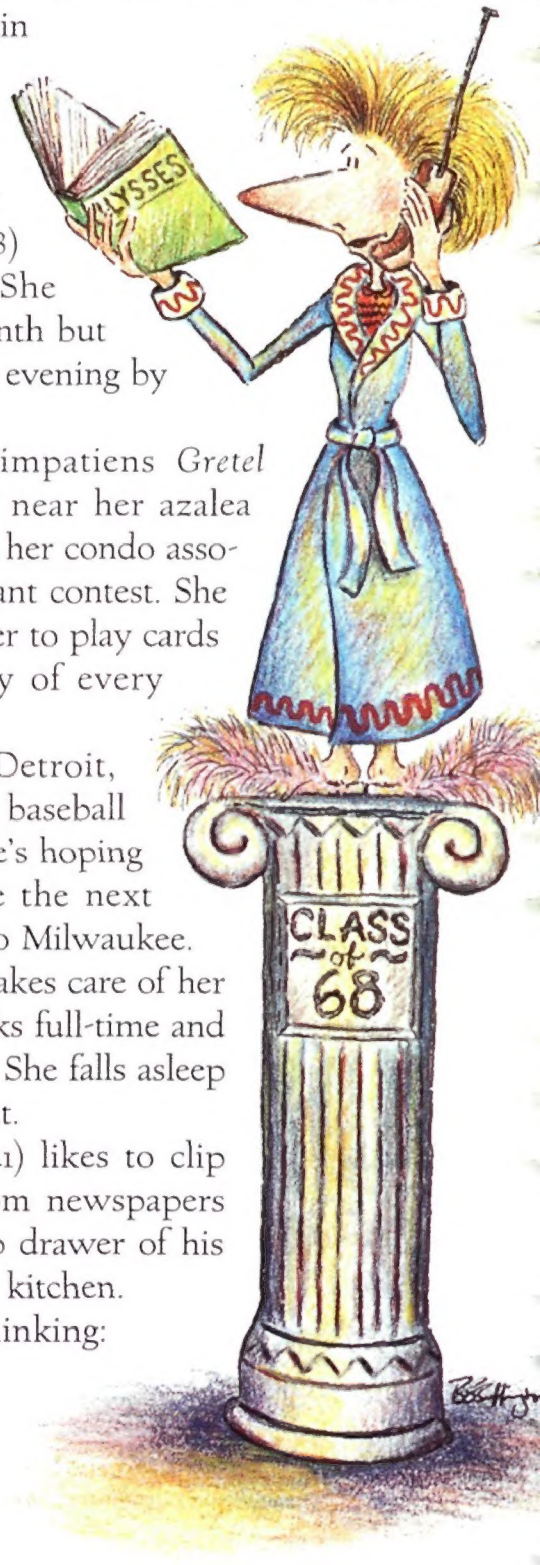
◆ Last summer, the impatiens *Gretel Greensleeves* ('39) planted near her azalea bushes won third prize in her condo association's annual border-plant contest. She and her friends get together to play cards on the third Wednesday of every month except August.

◆ During a trip to Detroit, *Mario Marcus* ('55) saw a baseball game at Tiger Stadium. He's hoping to catch a Brewers game the next time business takes him to Milwaukee.

◆ *Sandy Anderson* ('77) takes care of her mother and the kids, works full-time and volunteers at the hospital. She falls asleep on the couch a lot at night.

◆ *Stefan Stormslosher* ('41) likes to clip supermarket coupons from newspapers and stash them in the top drawer of his wife's writing desk in the kitchen.

I know what you're thinking: maybe we should just dispense with class notes altogether. Actually, that might not be a bad idea.



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